COAL AGE

A McGRAW-HILL PUBLICATION—ESTABLISHED 1911

DEVOTED TO THE OPERATING, TECHNICAL, AND BUSINESS PROBLEMS OF THE COAL MINING INDUSTRY

New York, May, 1930

VOLUME 35....NUMBER 5

On Their Way!

PROGRESS in mechanized mining is outstripping the forecasts of cautious optimists. Preliminary figures for 1929 show an increase of 75.6 per cent over the preceding year in the tonnage of bituminous coal loaded mechanically or semi-mechanically. Since 1926, the first year for which complete data are available, the quantity of bituminous coal so handled has grown from 10,545,000 tons to 37,854,000 tons—and the industry is hardly on the threshold of mechanical loading.

MECHANIZED MINING in four states accounted for 74.9 per cent of this tonnage last year, and these same states increased the quantity of coal loaded by machine and conveyor 83.4 per cent over their 1928 totals. Neither non-mechanized operations in these states nor districts in other states which have been reluctant to embark upon mechanization can dodge the impact of such a development. It is only a question of how soon they, too, will be compelled to join the march.

THE immediate incentive for such a step on their part undoubtedly will be a desire to reduce production costs. Eventually, however, the labor situation, now a secondary consideration, will take first place. Today there is little surplus of hand loaders. As knowledge of the machine spreads, the number of men willing to sweat out a living under old methods will steadily shrink. Employers who think they can match machine-production costs with lower wage scales or with greater efficiency in hand loading will be driven to mechanization to recruit labor.

WITH these changes and the concentration which is part of a modern mechanization program will come benefits not yet fully appraised. Mines will be in a position to compete with factories for the services of the second generation of workers, whose alertness and new viewpoints can contribute much to the industry. Concentration will open the way to a greater employment of equipment, and closer supervision of personnel should make mining safer.

THIS EXPOSITION of the future of mechanization is by no means new. But it is no longer a thesis merely of possibilities. The growth already recorded in the past few years and developments just around the corner have advanced possibilities to probabilities—tinged with the shadow of the inevitable.

Photo Courtesy Bell & Zoller Coal & Mining Co.

When the Afternoon Whistle Blows at Zeigler

WHY WILDWOOD?

+ An Economic Preview

By C. F. HOSFORD, Jr.

President, Butler Consolidated Coal Co., Butler, Pa.

WILDWOOD, the new mine of the Butler Consolidated Coal Co., in Allegheny County, Pennsylvania, represents the efforts of our company to convert an unprofitable coal investment into one capable of producing substantial returns under present adverse conditions. Convinced that the solution of the industry's problems lay not in government aid or regulation or in effecting consolidations of existing operations (the continued existence of some of which could not be economically justified), we determined upon the development of an operation which would apply manufacturing methods to coal mining as the true solution.

With virgin acreage to develop, the engineers selected to plan and supervise the work were not hampered by any necessity for adapting existing facilities to present or future needs or of recommending the charging off of large investments in equipment made obsolete by recent improvements in the industry. In their studies and plans, particular stress was laid upon such factors as:

(1) The most economical life of the property in order to determine annual capacity;

(2) Sources and types of labor available, and their relation to the problem of housing facilities and the extent to which mechanical loaders could be employed;

(3) Natural mining conditions and the types of cutting and loading machines best adapted for efficient and economical operation;

(4) Physical characteristics of the coal as affecting the equipment necessary to prepare it for available markets; and

(5) The possibility of multiple-shift operation in order to make the greatest possible use of necessary mechanical devices.

From these studies grew the plan of making Wildwood the first coal mine in America to be designed for 100 per cent mechanical operation. Mechanical loading, particularly in the Thick Vein Freeport seam, raised the problem of cleaning on a large scale, since steady operation—so vital where there is a large investment in loading equipment—can be attained only through ability to market at competitive prices a coal of uniform quality, comparatively free from moisture, and carrying a minimum of impurities. After careful study of available cleaning systems and actual tests on coal produced at Wildwood during the development period, the Peale-Davis pneumo-gravity process was selected as the one best suited to our operating conditions.

Many coal producers labor under the delusion that mechanization is a panacea for the ills of the industry. Such is not the case. Mechanical loading doubtless affords opportunity for large reduction in production costs, but it also creates new problems which must be solved before success is achieved. Problems of operating personnel and of maintenance of machines become more vital. The problem of multiple-shift operation likewise presents difficulties which must be overcome. Prevention of accidents grows more important, since we have greater concentration of our operating forces and a wide use of electrically driven machines. Capital investment and the interest charges thereon, maintenance, and depreciation charges make full-time operation imperative. Intensive preparation of coal is required. This is generally synonymous with some form of mechanical cleaning and thus means a large additional capital expenditure.

While mechanical loading at Wildwood has had the limelight, the facilities provided for preparing Wildwood coal for market should be of even greater interest to both producers and consumers. Crushers have been installed to break down the entire output of the mine to any size required to meet prevailing market conditions. Provision also has been made for screening any size demanded by the consumer and to provide any mixture or combination of sizes which may be required to obtain maximum efficiency in any boiler plant.

Exponents of coal-cleaning methods have stressed mainly the importance of ash and sulphur reduction. In our judgment, however, even more significance is to be attached to the maintenance of uniform quality as a factor in solving combustion problems. Without mechanical cleaning, even the most efficient management cannot entirely eliminate the variable human factor and cannot, therefore, guarantee the maintenance of any given analysis. This maintenance of a constant quality is a consideration of first water if successful operation is to be had with the increasingly complex combustion units now being installed.

To the engineer, to the coal operator, to the combustion expert and to the consumer, Wildwood, we believe, offers many interesting features. We hope it points the way to a possible solution of the economic ills besetting so many operations in the past decade. How successful this approach to solution finally will prove to be, time alone can tell.

ENGINEERING OBJECTIVES

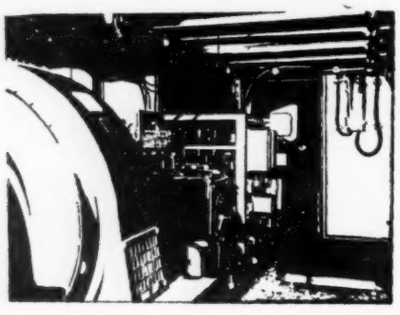
+ In Planning and Development Of Wildwood Mine

By JAMES H. FLETCHER

Allen & Garcia Co.
Chicago, Ill.

Successful operation of a completely mechanized mine requires management and close supervision; management that is in whole-hearted sympathy with the undertaking and able to inspire subordinates with the idea that coal mining is passing from the art as practiced by their fathers. The miner that is willing or able to put in a hand cutting in order to produce lump coal is a memory.

DESIGN of a complete mine which would justify the expenditure under present conditions in the coal industry and liquidate a frozen asset was the problem confronting Allen & Garcia Co. in the development of the Wildwood property of the Butler Consolidated Coal Co. In the spring of 1927, C. F. Hosford, Jr., president of the coal company, and his associates asked for a report and estimate of costs on a completely mechanized operation to recover 40,000,000 tons of coal of the Thick Freeport seam in a tract located in Allegheny County, Pennsylvania, 15 miles north of Pittsburgh. The report was presented in June, 1927, and in April of the following year a contract was awarded to build and develop a mine on a progress schedule calling for completion in 30 months. Wildwood is the result.



Maps, drill logs and coal cores were available, sufficient to establish the quality, seam characteristics, and coal contours. All natural conditions of the coal seam were carefully considered. The property has an approximate width north and south of two miles, and length east and west of four miles, with a coal dipping from east to west 1 to 1¼ per cent, and coal face north 25 deg. east. The main body of the coal is 7 to 8 ft. thick, with an area of lesser thickness along the north and south boundaries.

Several plant sites were under consideration, each with advantages sufficient to warrant careful field investigation. A plant located at the Wildwood station of the Baltimore & Ohio R.R. would have the coal seam 125 ft. below the valley at the junction of Willow and Pine creeks, be directly on the railroad and on an improved highway, with several near-by attractive villages capable of absorbing the employees required at the property, and would be advantageously located for underground haulage and drainage. It was decided that this location should be recommended, although extensive creek change would be necessary to provide the required building area.

The excellent quality of properly prepared Thick Freeport is well known. A large part of the field is controlled by steel and power companies operating captive mines. A close check on conditions that could be expected from a new operation were available and every courtesy shown by operating companies in permitting inspection of their properties in the same deposit. The seam contains a 12- to 14-in. central band of impurities, the bottom 6 in. of homogeneous bone, and top 6 to 8 in. laminated streaks of bone and coal. While this constitutes the major impurities in the seam, the slight ash variation permissible in high-grade coal has been found difficult to control by the usual methods of hand cleaning.

With coal the thickness of this seam the use of heavy equipment is

feasible and advantageous. After much study, it was decided to adopt a system of mining and milling, equipping the underground for mass production and the surface plant for mechanical cleaning. The size of the plant was placed at a minimum of 4,000 tons of clean coal in eight hours, with an average life of forty years on single-shift and twenty years on double-shift operation. The plan adopted calls for the recovery of pillars.

In designing the plant it was the aim to make it possible for each employee to accomplish the maximum by use of brains in place of brawn. The plant was visualized as a straight flow of coal from working face to railroad cars, with machines doing the drudgery under supervision of trained men. Preliminary calculations established the area to be maintained on advancing rooms and retreating pillars to meet tonnage requirements. Sketches on the coal-seam contour map gave a general idea of the most advantageous main entry system leading to the plant site selected, permitting blocking out the top plant in conjunction with underground development and surface contours.

Weighing first cost against operating advantages determined the general plan of rotary dump on mine bottom, an 18-deg. slope containing belt for 750 tons of coal per hour and tracks for handling equipment and material, a vertical exhaust shaft and mine fan, tipple and cleaning plant unit, two buildings to house other requirements of the plant necessary to locate at railroad track elevation, and the mine office.

Carrying charges on operation of this magnitude, plus the limited time to be in full operation, dictated installation of temporary equipment to proceed with underground development at the earliest moment. The main lines of the B. & O. pass north and south through the property, and surface contours were such that it was advisable to parallel them on the west with the empty and load storage tracks. Location of the shaft adjacent to the empty storage north of the main plant site permitted utilizing the permanent tracks for mine development and separated the surface and mine construction activities. The tipple location was adjusted according to requirements of the railroad empty and load storage and the slope portal, with cleaning plant immediately to the west, bath and lamp house close to the mine portal, shop buildings and storeroom with space for mine storage tracks and accessible to trucking supplies, office at the highway elevation adjacent to the local trade bins, with full view of the mine surface operation and convenient to the mine portal.

As engineers, we were confronted with many pioneering problems peculiar to the mine designed for complete mechanical loading, and cleaning one of the most difficult coal seams in a highly competitive field, in a relatively brief period. In the room and pillar territory it was desirable to maintain equal length rooms and pillars, pillar protection on retreat, standard turnouts for heavy equipment, maximum number of rooms on the same entry, minimum number of power load centers, equal length crosscuts, a direct sweep of fresh air across the break line, and maintain a minimum depleted area. The maximum cover of 350 feet and overlying strata were taken into consideration and it is believed the objectives are embodied in the room and pillar plan adopted.

The system of main entries, splitting the property from east to west, permits blocking out development that will give a new mine on recovery of each two to three million tons lying between the main entries and property boundaries. With the exception of the first block, which will be mined on the advance to the north property line, the acreage will be depleted on the retreating system, with provisions for a flow of air through regulators across the mined-out and depleted territory to the exhaust shaft.

In an operation using only day-labor employees, it is necessary to obtain the maximum efficiency of equipment installed. This required minimum movement of equipment and concentration of several hundred horsepower direct current in limited areas with a rapidly shifting load center. The standard method of permanently located power-generating stations required a prohibitive number of large copper feeder wires. The problem was solved by designing a portable substation.

Tests demonstrated cutting of the kerf in the top section of the band of impurities located near the center of the seam would free a percentage of the coal and permit removing the bone sections in large blocks. The lowest maintenance and large tonnage production could be expected only by preparing the coal suitable for loading and not requiring digging from standard shots. This could be accomplished by center cutting and shearing each room and entry. The turret type of cutting machine was selected and trackage was required in all places to the working face. Minimum amount of track laying was then required when using track-mounted loading machines.

Detail figures were compiled on the assumption that as a minimum territory would be open at one time, belt conveying would be the most economical method of handling coal from loading machines to the cleaning plant. But the detail work required in carrying a face on the room-and-pillar system in advancing and retreating 9 ft. per day of single shift, with each room tracked for the cutting and loading equipment, prohibited the installation of belt conveyors in place of mine cars.

The nearest approach to a belt system developed as a combination of portable, track-mounted conveyors 18 ft. long. These are a multiple of the 9-ft. cutting and are to transfer the coal direct from the loading machine into mine cars, handled in trains of sufficient capacity to hold the entire fall of coal. The installation cost is permissible when operating with a loading machine normally requiring two locomotives to maintain car change. The mine development plan has been projected with room necks and crosscuts on 72-ft. centers for uniformity in trackage and power wiring, and the portable conveyors which have been designed for this mine can be installed.

Not being necessary to weigh each

car of coal as it comes from the mine, it was decided the mine bottom could be handled by one man. If it was not necessary at times to judge between rock and coal, it could be made entirely mechanical, and we undoubtedly neglected television. Before laying out the slope bottom, the area was closely drilled and seam floor contours established. By careful planning, extensive grading was avoided, while a full gravity bottom was arranged with no interference between incoming and outgoing trips. The rotary dump placed in the center of the V formed by branches from the material slope is outside of the main ventilating current. Loads enter from the east on three-quarters of one per cent downgrade to the car haul, pass through the rotary dump, and leave to the west empty storage on a one and one-half and one per cent grade.

The entire output to the belt capacity of 750 tons per hour is handled by one man at the control board of the rotary dump. Cars passing in trips discharge coal into a 25-ton coal hopper feeding onto the belt going direct to the preparation plants, and by pressing a button a gate is opened which permits dumping the occasional car of rock into a 50-ton assembling hopper to be fed onto the belt and discharge into a rock hopper at the surface when the belt is not in service for handling coal. The entire quota of mine cars can be loaded during the night shift from development entries, stored on the main-line load haulage, and passed through the rotary dump without confusion.

Designing the cleaning plant required an engineering study of the raw material and underground condition by all departments to determine what was to be received, what was wanted as final product, and how the product was to be handled mechanically to best fit in with the whole project. Coal discharge by belt from the mine would have three classes of material: clean coal, coal with impurities and material of no value. Experience had demonstrated that loading machines did not specialize in one-man lumps and there would be a large range in sizes. To meet the demands of a specialized market warranted by the quality of the coal, close sizing and remixing were required.

The splitting point between hand picking and mechanical cleaning was made at 4-in. size, the tonnage above 4 in. to be split over two picking tables, each of extra length and design, to allow adequate opportunity to pick and inspect the coal as it was loaded into railroad cars. There was to be no necessity for the pickers to hesitate in removing a lump containing some impurities on account of total loss to the company. Coal with impurities had to pass to a crusher, then join the flow of minus 4 in. entering the mechanical cleaning plant. The lump material of no value was to pass direct to the refuse. The 4x$\frac{3}{4}$-in. rejects for the cleaning plant would contain coal that had to be liberated by finer crushing and recleaning. The final results were to be only clean coal to the market, with minimum merchantable coal left in the mine or transferred to the spoil bank. To obtain knowledge that the above results were being obtained required installation of adequate sampling equipment and a chemical laboratory.

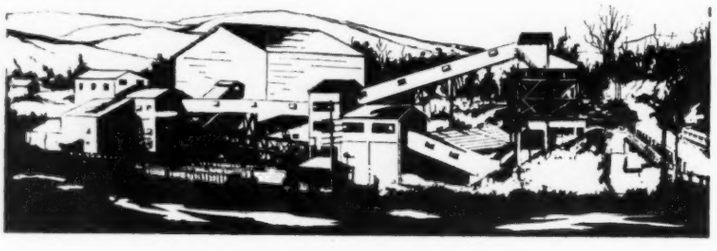
Cleaning Thick Freeport is recognized as a most difficult problem. While we believed either the wet or dry process could be employed successfully, the sales organization felt that in the particular markets to be served there would be less sales resistance with a dry cleaned coal. The design of the cleaning plant was delayed until coal prepared and loaded according to the method to be followed in normal operation was available from development work at the Wildwood mine. Carload lots were passed through the test plant until sufficient data were accumulated to warrant us in informing our clients we were prepared to proceed with the design of the cleaning plant now in operation at Wildwood.

The material slope permitted handling all major repairs and overhauling of equipment at a surface shop where equipment and light would be available to do a first-class job at lower cost than it could be done in the mine. The equipment to be maintained would require machine and electrical work as well as blacksmith service, with parts from the

supply room. By placing these four departments under one roof, the greatest operating efficiency was possible and lower initial construction costs were achieved.

Successful operation of a completely mechanized mine depends on the hearty co-operation of employees. As the workers would be required to travel some distance, it was believed they were entitled to adequate provisions for changing clothes and a bath. The grouping of change room, bath, lamp room, first aid, mine manager's room, safety engineers, instruction room, and heating plant under one roof, with the bulding close to the entrance of the mine, permitted economical construction, adequate accommodations for each division, and fitted into the ground plan. While accommodations provided under this roof are omitted at many mines, we feel large indirect returns are received.

The equipment was to comply with the laws and regulations of the State of Pennsylvania. Every electrically operated unit underground that would or might leave the main-line haulage was to be equipped with gasproof permissible motors and control. The type of equipment and material best suited for the problem at this particular mine were specified and where obtainable from more than one source, were submitted for competitive bids, and contract let in accordance with the best interests of the owners.



MACHINE CONSIDERATIONS

+ Determine Underground Planning At Wildwood

By ALPHONSE F. BROSKY

Associate Editor, Coal Age

THOUGH the underground layout and methods of working at Wildwood are those of room and pillar mining, as a whole they have no counterpart in any other coal-producing plant in the country. The layout is different, because complete mechanization, upon which the operating program is based, demands change from the orthodox. Dependent working methods are different for the same reason. Neither the engineers in charge of construction and management, nor the holding company has allowed whims or fancies to guide decisions. The ideas incorporated in the plan which at first may appear to be new or radical are merely tried and proved ideas applied in a different way.

The great degree of concentration encompassed within this mine is unmatched by any other plant where mining is by rooms and pillars. Conversely, the mine is different from others chiefly with respect to those factors that contribute to or are influenced by concentration. But 89 working places, in a single working section with an over-all area of, roughly, 80 acres, are planned to produce nearly 5,000 tons of coal in eight hours.

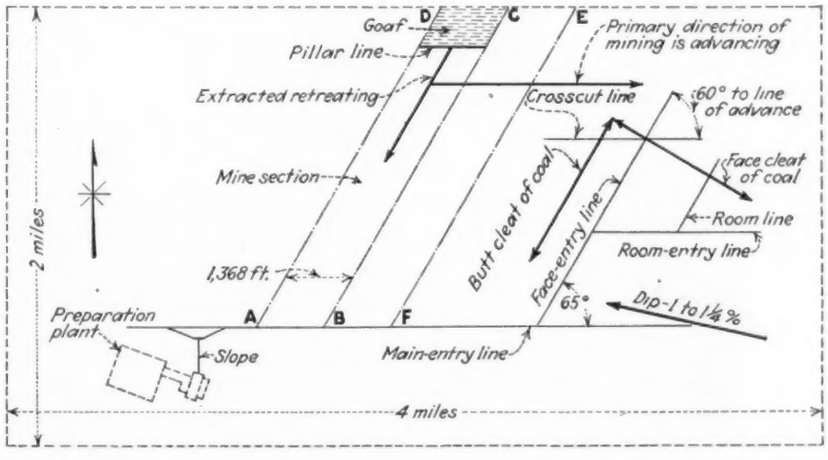
In the schematic sketch, Fig. 1, are presented the pertinent factors which influenced the mine layout. This sketch shows the directions and relations of the dip, the coal cleats and the entries with respect to each other and with respect to the general outline of the property. The tract is rectangular in general outline and measures approximately 2x4 miles, with the long axis running east and west. The seam being mined is the Thick Freeport, which is 7 to 8 ft. thick over the main body of the tract. It outcrops at the eastern extremity of the property and dips generally westward on a prevailing gradient of 1 to 1¼ per cent. The cover for the most part varies in thickness between 200 and 350 ft.

Location of the plant at the Wildwood station, on the Baltimore & Ohio Railroad, is more favorable to the underground layout than would have been any other possible site. With the plant at this point, the direction of the main entry is along the long axis of the property and the grade in main haulage is in favor of loaded cars, as is also, to a large degree, the grade of room entries. Through a fortunate combination of circumstances—which has been taken advantage of—the butt cleat of the coal and the strike of the bed are practically parallel. Face entries and rooms, consequently, are generally level. Furthermore, as the primary direction of development and extraction is up the rise, or eastward, drainage is facilitated and water will not generally accumulate at the faces.

Incidentally, with the plant located at Wildwood, advantage is taken of a geological factor, in the erosion which formed Pine Creek Valley and allowed the sinking of a slope through only 125 ft. of cover. The construction of this slope for the lifting of coal to the surface by a belt conveyor and for the handling of materials and supplies enabled straight-line and continuous movement of the coal from face to railroad car. The economic advantages of the chosen plant site with respect to the outside of the mine have been mentioned in a previous article.

While the primary direction of coal extraction is eastward, with the slope

Fig. 1—Schematic Sketch Showing Characteristics of Coal Seam and Their Relation to the Layout



bottom as the base, recovery within a mine section will be on a full retreat away from the boundary, as indicated within the inclosure *ABCD* in Fig. 1. The adjacent mine section *BCEF*, on the advance side, will remain untouched (except for the driving of blocking-out entries), until after practically the whole of section *ABCD* has been mined out.

The layout which will be followed in mining a section, such as *ABCD*, is reproduced in Fig. 2. It will be noted that in this plan, the section is shown as being mined advancing from south to north, instead of retreating from north to south in accordance with the intended standard. This departure from the standard for the mine will be applied only to the extraction of one or perhaps two of the first sections to be mined. By this procedure the mine will be brought up to full production in the shortest time. Meanwhile, development can be pushed toward the boundary in preparation for mining remaining sections retreating toward the main entry.

Right-angled turns are avoided in the mine layout so far as possible. Practically all rooms and entries are being turned at an angle of 65 deg. at the juncture. Right-angled turns are used only in the driving of stub rooms and entries where the shape or restricted size of the area being tapped does not permit the utilization of an easing turnout. All crosscuts, whether between rooms or headings, are turned at an angle of 60 deg. to the line of advance.

The use of track-mounted equipment for cutting, drilling, and loading the coal, governed the adoption of the off-the-perpendicular turnout. These machines are large and heavy and of long wheelbase, as also are the mine cars, and require easy turns for quick and safe transfer from one place to another. To illustrate the necessity for the wide-angled turnout, one of the two types of loading machines in use, the Oldroyd, measures 57 ft. in length and weighs 30 tons.

Every place in the mine is laid off and driven on sights, including crosscuts. The reason for this practice should be readily apparent. Mining of the coal in the Wildwood property is considered simply a problem combining only two major processes, excavation and transportation. As such, the timing, sequence and rate of extraction must be regulated by engineering standards as precise as those applied to the removal of overburden and coal in a modern stripping operation.

Headings are driven 12 ft. wide, on 50-ft. centers. The main entry, running east and west across the property, is on the six-heading system flanked by barriers 300 ft. through. Main face entries are driven in a multiple of five headings protected by 150-ft. barriers. Room entries are driven in a multiple of four headings, all of which serve as intakes when room and pillar mining commences. Three headings would be sufficient for ventilation purposes; four are driven to assure economy in entry driving by machines.

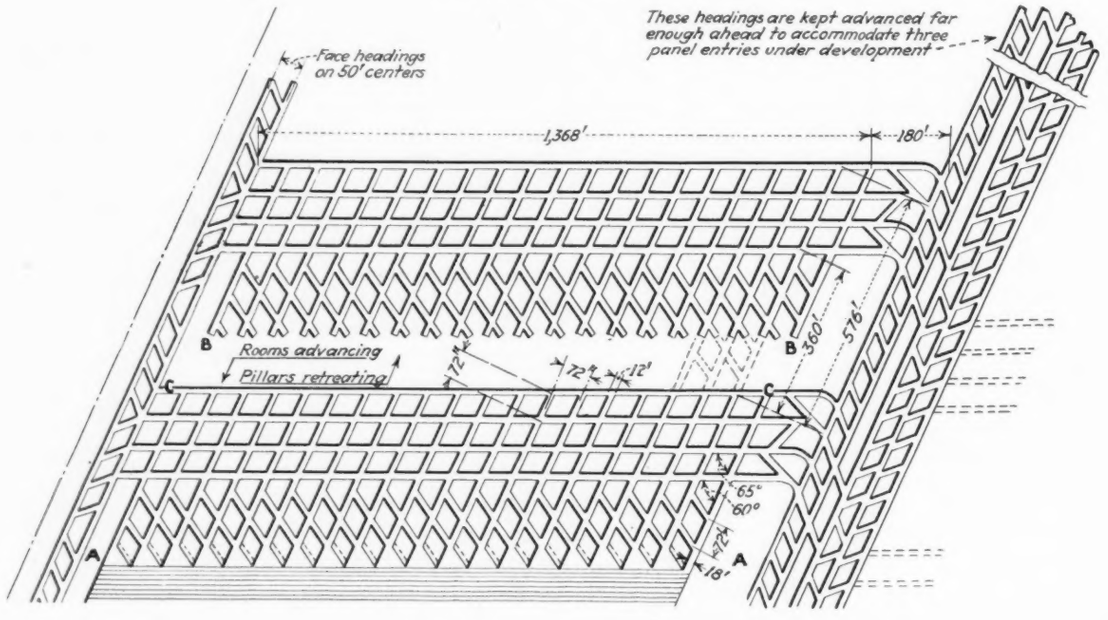
Intervals between crosscuts in the dividing pillar between intake and return headings are made large to minimize the short-circuiting leakage of air from one to the other. On the main entry these crosscuts are driven on centers of 360 ft.; on face entries they are driven on 180-ft. centers. All other crosscuts, both off rooms and headings, are turned on 72-ft. centers.

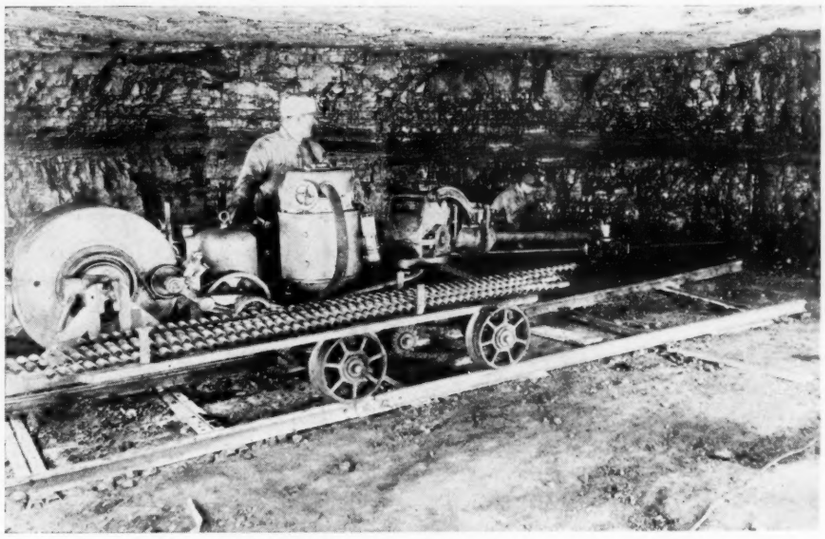
By referring to Fig. 2, a good idea may be had of the plans for concentration which will enable the getting of nearly 5,000 tons from a single mine section. This production, together with that coal which comes from major development elsewhere in the mine, will meet the normal shift capacity of the preparation plant. The designed capacity of the plant is 750 tons an hour, or 6,000 tons of mine-run in eight hours.

The width of a section from which the large block of tonnage will be gotten is roughly 1,500 ft. In the section, but five room entries will be completely or partly open at any one time. While pillars are being extracted off that room entry nearest the goaf, rooms will be driven from the adjacent room entry and the three remaining room entries will be in stepped stages of development. All pillars off the first entry and all rooms off the second entry will be worked simultaneously on mining fronts parallel to the room-entry line.

As the pillar front *A-A* (see Fig. 2) retreats from the goaf and advances toward solid coal, the room front *B-B* will advance toward the goaf, the re-

Fig. 2—Layout of Working Places in a Mine Section Which Will Yield Nearly 5,000 Tons a Shift





Shotholes Are Placed by a Truck-Mounted Drilling Machine Which Is Self-Propelling

spective movements of the two fronts being so timed that they meet on the line *C-C*. Face entries, too, will be completed only as needed. By adherence to this schedule, neither places nor the track in them will stand idle for any appreciable time, if at all. A compilation of the number of tons to be produced by each and by all of the places in a section in one working shift is presented in Table I. These tonnages are based on the taking of one cut from each place.

As indicated in Fig. 2, along the line *A-A*, an attempt will be made to draw the pillars by open cuts. Protection is afforded machines and men by the projecting points of the pillars. It is believed that this method will be practicable because of the speedy rate of extraction made possible by machine loading and because of the comparatively shallow cover (maximum of 350 ft.) over the coal. The experience thus far in mechanical mining at Wildwood points to the probability that the rooms and pillars comprising a panel will be completely mined in 140 working shifts.

Above the Thick Freeport seam is the Conemaugh group of rocks, consisting of various shales, some limestone, and several sandstones of considerable aggregate thickness. Of these strata, that which is most difficult to break in the process of taking pillars is the Mahoning sandstone. This stratum ranges in thickness from 20 to 35 ft. It is of coarse-grain texture and hard. The elevation of this sandstone above the coal is not constant. In places it replaces much or all of the softer measures between it and the coal. Directly over the coal is 6 to 10 ft. of slate which, above the Wildwood property, exhibits unusual strength contrary to the usual experience of other mines in the field. Below the coal are a 6-ft. bed of fireclay and a 3-ft. stratum of limestone. The waters in this mine, incidentally, are alkaline.

Little or no timbering will be required in first mining, which represents about 30 per cent of total extraction. The few rooms that have already been driven—they are 18 ft. wide—required practically no timbering. Even at turnouts, where the open roof span is comparatively wide, supports have not been needed under normal conditions. Occasionally, however, an area of roof of subnormal strength is encountered. Such roof areas are usually supported by 70-lb. re-used rails, set as crossbars.

The taking of pillars by open cuts will require an unsupported span of roof 17 to 18 ft. wide between solid coal and props in the goaf area. Nine feet of this span will be taken up by the cut in the coal. The open span of roof will be supported on the goaf side by three rows of timbers on 3- to 4-ft. centers. As the cover over the Thick Freeport seam is made up of a considerable thickness of sandstone, pressure-relieving roof breaks occur only at intervals of hundreds of feet. In pillar mining, therefore, standing stumps of coal or timbers cannot be abandoned in the goaf.

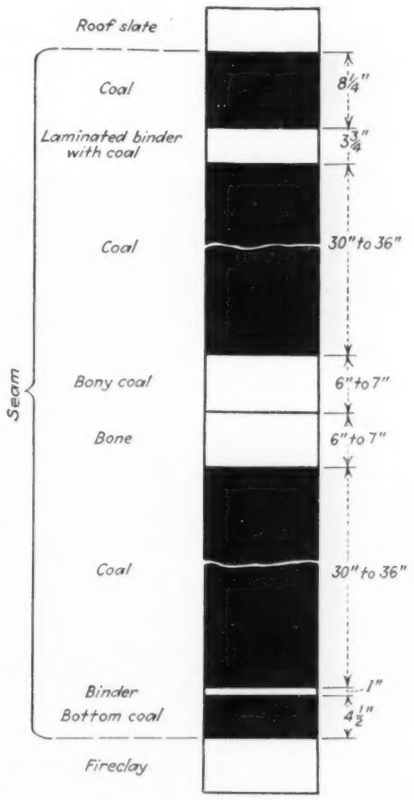
If the area in the wake of a retreating pillar line is not cleared of these obstructions to free roof falls, the natural balance and other tendencies of the roof will be so disturbed as to cause trouble. Because of these conditions, it is more manifestly necessary in this seam than in most others to move roof supports in step with the retreat of the pillar line. This has suggested to the management an investigation of the possibility of using mechanical supports.

As extraction approaches a crosscut in a pillar, the support given to the roof by coal will be decreased. The last cut of the pillar between a crosscut and the goaf may have to be taken from the crosscut. If this last cut is taken from the goaf side, the crosscut must first be timbered.

Owing to the occurrence of sandstone strata in the cover, over the Thick Freeport seam, major roof breaks do not take place frequently. Generally the breaks come at intervals of 500 to 600 ft. After the occurrence of a break, relief from pressure naturally is experienced for a time. Then the pressure gradually builds up again until relief is again obtained from the next break. In the Wildwood layout, the width of room panels, including headings, is 576 ft. It is believed that falls will occur at intervals approximately equal to the width of the panels.

It will be noted by reference to Fig. 2 that the room crosscuts are at an obtuse angle to the room headings. These crosscuts are turned, as they are to provide a pronounced sawtooth point on each room pillar for protection of men and machines in

Fig. 3—Representative Cross-Section of the Coal Seam at Wildwood



the open area between pillars. Owing to this divergence of directions of room crosscuts and headings, the greatest potential trouble in pillar drawing would seem to lie in carrying the pillar line across the room headings. If major breaks occur at intervals of 500 to 600 ft., in accordance with the general experience in this field, it may be possible to control them and cause them to take place near the heading closest to the goaf. Thus the pressure would be removed and no trouble encountered in taking the panel-entry pillars. The first pillar line is to be started under 200 ft. of cover.

The face and butt cleats of the coal are well marked. In Fig. 3 is reproduced a representative section of the coal bed. The occurrence of bone and bony-coal partings in the Thick Freeport seam causes this coal to be one of the most difficult to mine and prepare for an exacting market. Prior to the completion of the mechanical cleaning plant, which was put into full operation on April 21, the bone and bony coal in the middle of the bed had to be mined separately and dumped as refuse on the outside, in order that the shipped coal would meet the company's marketing specifications.

This practice, though necessary, was naturally wasteful of coal resources and labor. The 6-in. band of bony coal contains about 60 per cent of merchantable coal recoverable by mechanical cleaning. And as face preparation involved shearing also, and as all cutting necessarily had to be done at one time, clean-coal cuttings from the shearing cut were removed with the refuse. The aggregate of the cuttings disposed of as refuse amounted to 18 per cent of the tonnage produced. This system of face preparation not only complicated mining methods but required the employment of about 60 men for shoveling cuttings and for cleaning up during the machine-loading operation in a daily mine output of 3,000 tons gross. Mechanical cleaning has eliminated these men.

Table I—Expected Tonnage From One Section in Eight Hours

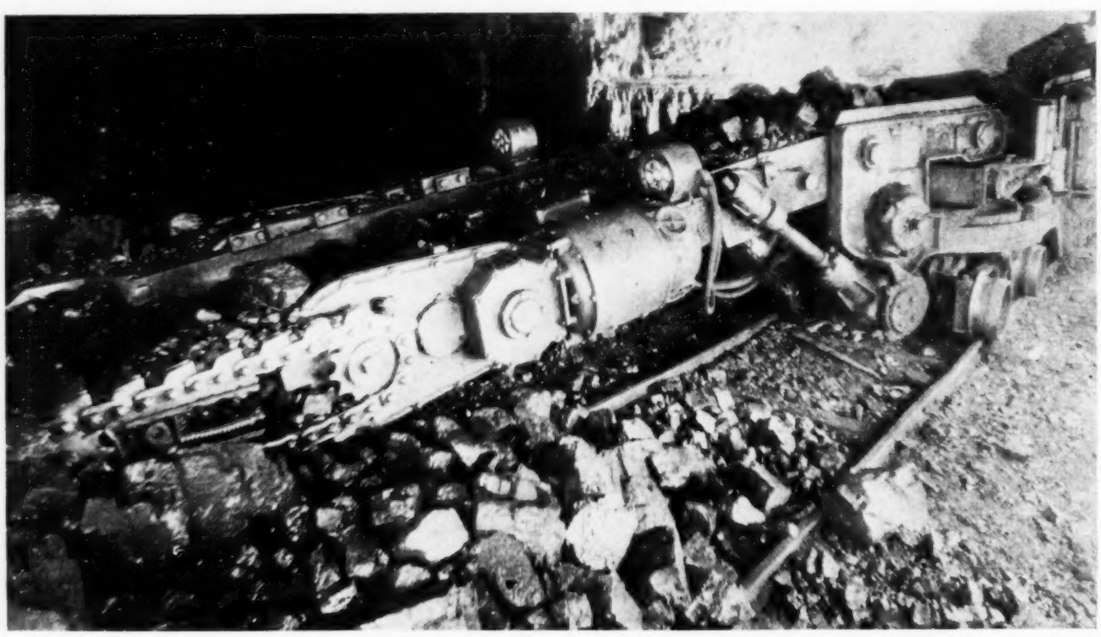
20	Rooms advancing, 18 ft. wide	= 51 tons each or	1,020 tons total
19	Crosscuts, 12 ft. wide	= 35 tons each or	665 tons total
19	Room pillars retreating,	= 120 tons each or	2,280 tons total
3	Room entries, 7 places each	= 245 tons each or	735 tons total
1	Main face entry, 8 places each	= 280 tons each or	280 tons total
			4,980 tons total

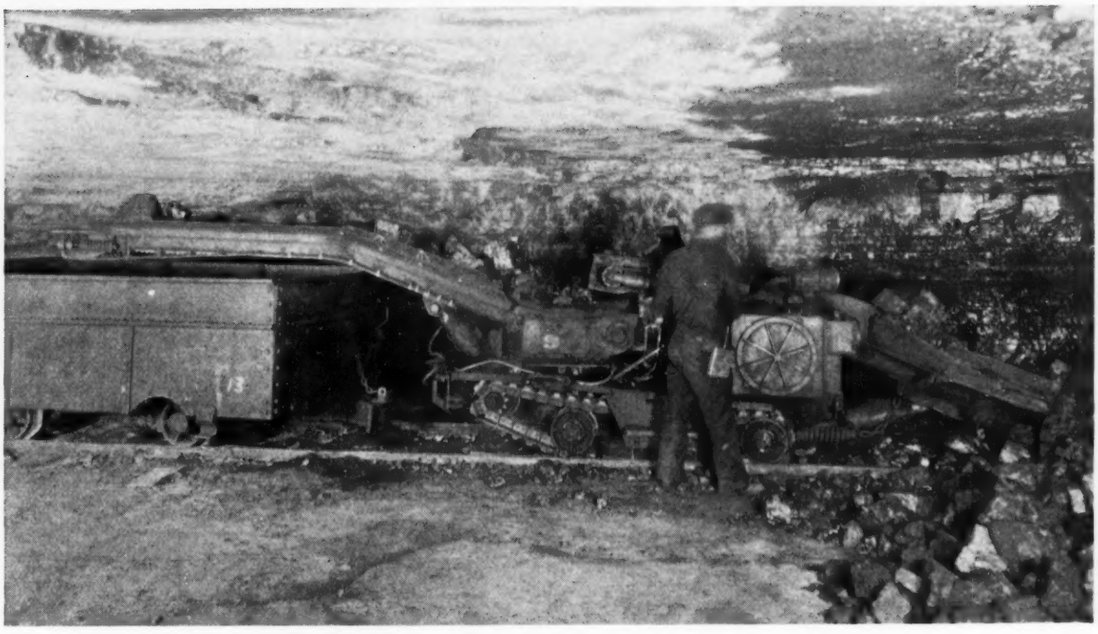
The cutting machine adopted as standard is the track-mounted Oldroyd which is equipped with a universal cutter bar for both horizontal and vertical cutting. Under the old system of cutting, this machine took two cuts horizontally and one vertically, each cut being 9 ft. deep. The first horizontal cut was made in the bony coal and the second in the bone band. Then the cutter bar was turned and the shearing cut was made in the center of the place. One of these machines with a two-man crew cut 7 to 9 places, or 200 to 300 tons, depending on whether the places were headings or rooms.

In the method of face preparation now being followed, only one horizontal and a shearing cut are taken. The cuttings are left for loading with the lump coal, and so all of the seam extracted goes to the preparation plant. The horizontal kerf is made in the bony coal, which is easier to cut than the massive bone occurring directly beneath it. The selection of this cutting horizon has a twofold advantage: First, it sends the bony coal to the preparation plant in a finely divided state, with impurities largely broken from clean particles of coal; second, it leaves the bone for blasting and loading with the lower bench of coal. This bone is massive and when removed by blasting it breaks up into large pieces which can be removed readily from the lump coal on the picking tables. For these two reasons, the cutting method removes a big burden from the cleaning plant.

Two types of loading machines, Joy and Oldroyd, are in use. Six of the first type and three of the second are now in operation. As is generally known, the Joy is a caterpillar mounted machine, while the Oldroyd stays on the track while loading coal. The broad plan of mechanization adopted for this mine calls for the use of machines which operate en-

This Type of Machine Is to Be Used in Mining Wide Faces—Rooms and Pillars





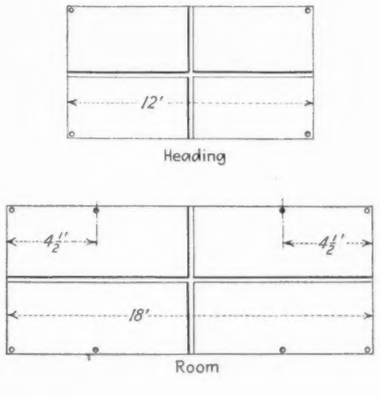
The Caterpillar Type of Loading Machine, According to Plans, Will Be Confined to Narrow Work

tirely on track, so far as feasible. For this reason, the Oldroyds will be used in room mining and in pillar extraction as tonnage machines, and the Joys will be confined to development work. All machines have been confined almost entirely to development work thus far, as few rooms have been driven. Further discussion of the mechanized mining operations apply strictly to production by the old method of face preparation, whereby cuttings were loaded by hand shoveling. As the new method of face preparation was only recently instituted, related performance data are not available. A shift is of eight hours' length.

Each of the Joys was assigned ten places, and with a crew of 16 men, including three hand shovelers who loaded out the cuttings, produced 200 to 230 tons per shift, double-shifting. The crew proper was composed of the following men: One loading machine operator and one helper; two cutters and one scraper; one driller; one shotfirer; two trackmen and the half-time services of a third; three hand shovelers; two haulage men; the half-time services of one man for pumping and hanging brattice; and one foreman. Each of these machines was served by one locomotive, one cutting machine and the half-time attendance of another, and one hand-held electric drill. One of these Joy machines established a record of driving a total of 171 lin.ft. of entry in three consecutive shifts.

Only one Oldroyd loader was in operation when these data were collected. This machine was assigned twenty places, and with a crew of 23 men, including 6 hand shovelers for loading out cuttings, produced 350 to 450 tons per shift, double-shifting. The crew proper was composed of the following men: One loading machine operator and one helper; four cutters; two drillers; one shotfirer; three trackmen; six hand shovelers; three haulage men; one man for pumping and hanging brattice; and one foreman. This machine was served by two locomotives, two cutting machines and one truck-mounted drilling rig.

Fig. 4—Showing Position of Shotholes in Headings and in Rooms



This last machine is the Sullivan, type CD4, and is self-propelling. Three of these drills are now installed. With inexperienced crews each has been drilling 75 to 100 holes per shift.

The placement of holes for blasting in rooms and in headings is illustrated in Fig. 4. Drilling precedes cutting, and holes with a diameter of 2 in. are drilled to a depth of 9 ft. Each of the upper holes is charged with one to two sticks of duPont Monobel 9-A and each of the lower holes with three to five sticks of the same explosive. The average charge per hole is 0.3 lb. of explosive, and blasting yields 8⅓ tons of coal per pound of explosive. All holes are drilled horizontal.

While the Wildwood mine is yet in the development stage, the results thus far achieved therein are favorable to mechanized methods. Ground was broken for this plant July 5, 1928, and the first coal was mined Dec. 5, 1928. Up until April 1, 1930, 27 miles of headings and crosscuts had been driven. At the end of this period the rate of development had reached 3 miles per month, and the daily mine output of merchantable coal about 3,000 tons. The output per man at the plant per day was 12.1 tons inclusive of rejected cuttings.

TRANSPORTATION

+ Geared to High-Speed Production At Wildwood

TRANSPORTATION, of primary importance in any mine, becomes a vital factor at a fully mechanized, highly concentrated operation, such as the Wildwood mine of the Butler Consolidated Coal Co. Here, where a large amount of equipment must have access to the face at all times, the design of the transportation system must incorporate every provision that will prevent loading machines, coal drills, cutting machines, gathering locomotives, and cars from interfering with each other and that will maintain a steady and non-fluctuating flow of coal to the surface.

Steel mine cars carry the coal from the loading machines to the underground dump at the slope bottom, where a belt conveyor takes over the job of putting it on the tipple. When the full production of 6,000 tons per shift of eight hours is attained, at the end of this year, eight cable-reel locomotives, seven storage-battery locomotives (with one extra battery), and two haulage locomotives will be in constant use between the working places and the slope bottom. Average length of haul for the gathering locomotives will be 1,100 ft., and each will handle 80 loads per shift, or a total of 400 tons of run-of-mine product. The 250 cars in use—each holding an average of 5 tons will be dumped five times a shift.

The two haulage locomotives in use will each haul about 50 24-car trips per shift. When the average length of haul becomes greater than 1½ miles, the haulage locomotives will be run tandem, pulling trips of 48 cars. Maximum length of the main-line haul at the end of the life of the property will be 10,000 ft. When full development is reached, at the end of the present year, the average length of main-line haul will be about 4,000 ft.

As two-thirds of the daily production will be obtained from two room entries, one advancing and one retreating, in which there will be a total, aside from the mine cars, of five loading machines, five coal drills, eight cutting machines, and ten gathering locomotives in continuous operation, track layout becomes an item of importance. Of greatest weight is the problem of supplying facilities for the speedy movement of cars to and from the loading machine. In rooms, 30-lb. track in all openings, as in Fig. 1, to remain until the pillars are removed, supplies the answer. Thus the track in the rooms and crosscuts serves the triple purpose of developing the panel, facilitating car movement, and transporting the coal mined in pillar robbing.

In entry driving, changing facilities are equally important if the machines are to be kept producing at a maximum. When main entries are advanced, track is not left in all the passageways, however. The practice is to keep steel in two crosscuts back of the faces being worked, one of which is used by the gathering locomotive for car changing and the other as a roadway for equipment which must go to the back entries. Track also is necessary in all openings while driving room entries, though later a part of this is removed, as shown in Fig. 1.

Two gathering locomotives attend each of the Oldroyd loading machines to cut to a minimum time losses in changing. Under present conditions, only one car can be loaded at a time, after which it is pulled out by one locomotive and stored in a crosscut while the other locomotive places an empty under the loading conveyor. To enable the machines to load a complete trip at a time, it is proposed to use portable belt conveyors back of each of the loaders, which will empty the coal into cars at a crosscut and allow full trips to be loaded without changing.

As loading out a face at Wildwood is a matter of minutes rather than days, and as the cutting and drilling machines ordinarily must have immediate access to the cleaned-up places to complete their alloted tasks without delay, ordinary tracklaying has been supplanted by a method embodying the use of portable turnouts and portable track sections. Both are made of 30-lb. rail laid on steel ties. The portable turnout, shown in Fig. 3, is built in two sections, both of which are approximately the same weight. Also, the two sections have one dimension not exceeding 6 ft. 3 in. Such division enables turnouts to be transported or handled with a minimum of effort, and the assembled unit can be placed in the center of a 12-ft. entry, clearing the rib on the curved side before a side-cut is made to start a crosscut.

Portable sections are furnished in lengths of 9 ft. for the straight sections, approximately the advance of the coal face in one cut, while the curved sections are of different lengths and curvature to correspond to the angles at which crosscuts are turned. Rails are welded to the ties to prevent the tracklayer from tearing them apart, with consequent destruction of the units. Methods of installing the portable turnouts and track sections in driving main entries, room entries, and rooms are shown in Fig 4.

Naturally, the use of preconstructed sections precludes any haphazard method of tracklaying. Spads are set for driving all openings, and the turnouts are placed in the center of the entry, with the point of the frog

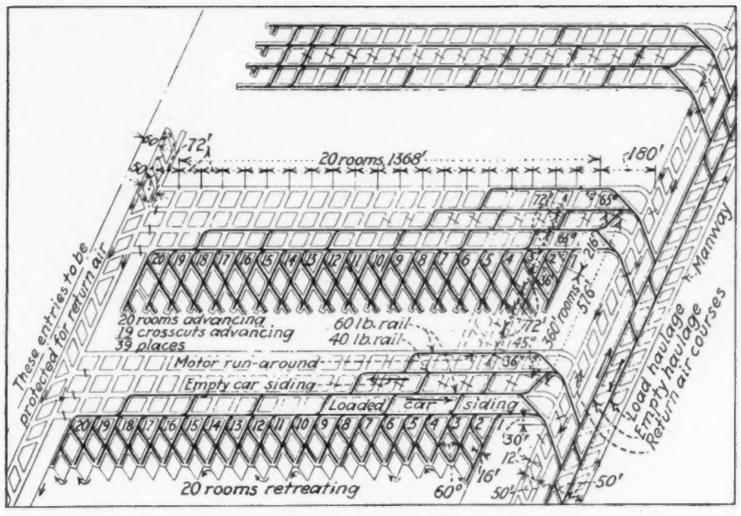


Fig. 1—Track Installation at the Wildwood Mine

4¾ in. back of the spad. On the curve side, one or two curves are placed ahead of the frog and straight sections are added until the crosscut is broken through, when a turnout is laid in the entry just broken into as shown in Fig. 4. Curves with a radius of 38 ft. were adopted as standard to allow the mine cars, which have an extra long wheelbase, and other equipment to operate smoothly and with the least chance for wrecks.

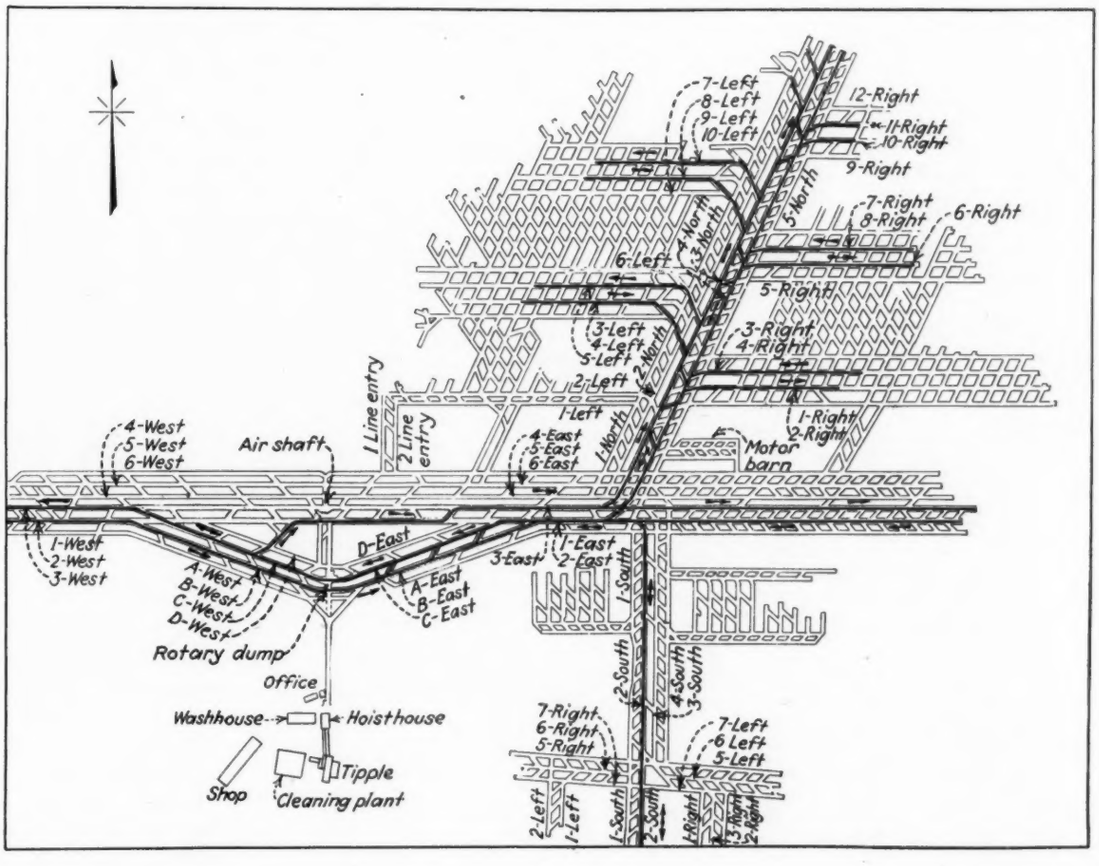
Loaded and empty trips operating over the main haulage roads are kept separate until the room entries are reached by the use of two entries, as shown in Fig. 1. On roads over which outbound or loaded trips operate, 60-lb. rail is used. Inbound or empty trips travel through a separate entry over 40-lb. steel. The 60-lb. steel also is extended into the room entries where loaded trips stand and heavy machinery and locomotives must run around the cars, as shown in Fig. 1. To insure smooth operation over main haulage routes, curves are put in with a radius of 150 ft.

Rail weights on both main and secondary haulage roads were dictated by the character of the traffic. Thus, 60-lb. steel was picked to withstand the stress generated by the operation of 15-ton haulage locomotives pulling loaded trips of 24 cars when operating singly or 48 cars when in tandem, while the absence of the coal load on the return trip permits the use of 40-lb. steel on the empty haulage routes. In rooms, ability to hold up under heavy equipment along with the maximum of portability were the factors considered in the choice of 30-lb. steel.

Wood ties are standard on all main haulage routes and under room entry track. Where the latter is concerned, though the life of track is short, wood ties are used under the 30-lb. rail, because of the large quantity of coal that will pass over it before it is torn out. Main roads are graded where necessary for even operation of haulage equipment.

Gathering locomotives haul cars loaded by the machines to the loaded-car sidings shown in Fig. 1, where they are made into trips of 24 cars. From there they are taken to the dump by the haulage locomotives.

Fig. 2—Main Haulage Routes and Slope Bottom Plan



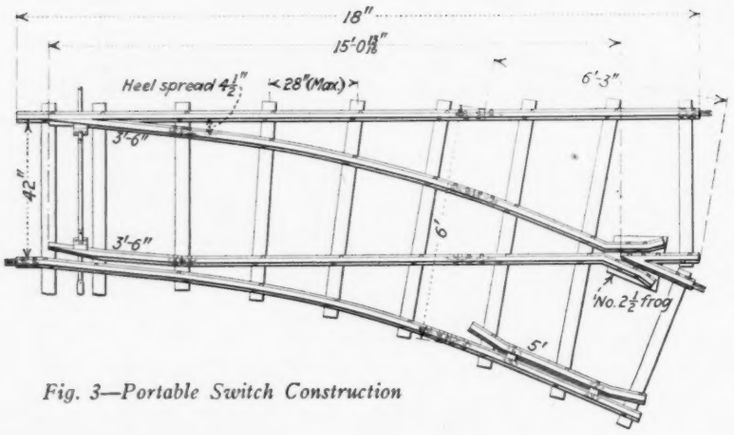


Fig. 3—Portable Switch Construction

Haulage locomotives use the run-around track to get in front of the loaded trips, and this track also is used by other equipment which finds it necessary to leave the room panel. By using three tracks for load and empty storage and for run-around purposes, the fourth is reserved for the use of gathering locomotives and other equipment working in the rooms or on pillars.

The slope bottom is designed for free access from either side of the mine. As shown in Fig. 2, loads from both the east and west sides of the mine are dumped from the east side of the bottom and empties go out to the sections from the west. Loaded trips from the east come direct to the dump on C-East entry. Loads from the west side of the mine are hauled through B-West entry to the east side of the dump, and are placed on C-East entry for dumping. Haulage locomotives cut off on C-East entry and travel to the empty side of the dump through D-East and D-West entries. Empties for the east side of the mine are pulled through the cut-off entry to the west of the dump and travel out 3-East entry. Empties for the west side of the mine travel directly back over 3-West entry.

Cars are dumped at the bottom by a one-car rotary dump with a capacity of 6,000 tons per shift. From the dump, the coal goes to a hopper holding six cars, and by opening a gate in the chute, the rock goes to a separate bin of the same capacity. Both bins are equipped with feeders for loading the material on a belt conveyor for transportation to the tipple. The loaded track leading to the dump and the empty storage track are laid to grades of ¾, 1½ and 1 per cent, respectively, sufficient to help the car feeder but not enough to make setting the brakes a necessity. Cars are controlled on the bottom by a 30-ft. car feeder with a capacity of 50 loaded cars, equipped with a hydraulic brake for stopping the trip. In dumping trips, two loaded cars always are kept on the incoming side of the dump and incoming trips are coupled to them.

Coal is transported to the tipple by a 54-in., 12-ply rubber belt, 900 ft. between centers of the head and tail sheaves. The inclination of the conveyor is 3 to 1, its capacity is 1,000 tons per hour, and it operates at a speed of 350 ft. per minute.

All-steel cars, of A. & G. design, built by the Watt Car & Wheel Co., with semi-automatic swivel couplers, spring draft gear, and spiral spring suspension are used for transporting the coal from the loading points to the dump. Owing to the fact that the coal at Wildwood thins out around the edge of the property, the mine cars were designed with a height of 36 in., with an additional 12-in. top extension for use where the coal is high. Track gage is 42 in., and the capacity, level full with 12-in. top extension, is 4.66 tons. The weight of the car without load is 5,700 lb. Principal dimensions are shown in Fig. 5. When low coal is encountered, the extension can be removed by cutting a few rivets, making a car 36 in. high with a capacity level full of 3.08 tons.

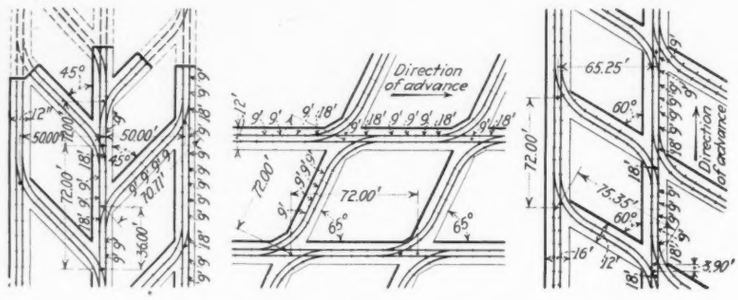


Fig. 4—Use of Portable Turnouts and Track Sections. Left, in Main Entries; Center, in Room Entries; Right, in Rooms

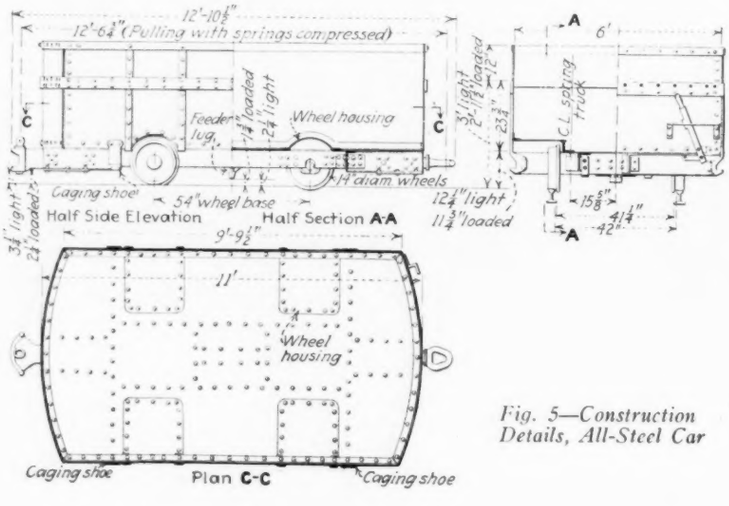


Fig. 5—Construction Details, All-Steel Car

Locomotive speeds and weights are as follows: Mancha storage battery (gathering)—weight, 9 tons; speed, 4½ m.p.h.; Goodman cable reel (gathering)—weight, 8 tons; speed on trolley, 5 m.p.h.; Westinghouse haulage—weight, 15 tons; speed, 9 m.p.h. Cable reel gathering locomotives are used in entry and room development but, as the Pennsylvania regulations governing operation of trolley locomotives in a gaseous mine precludes their use in pulling pillars, storage-battery locomotives will be used for this purpose exclusively.

NEW FEATURES IN

+ Electrical and Mechanical Design

At Wildwood

By J. H. EDWARDS

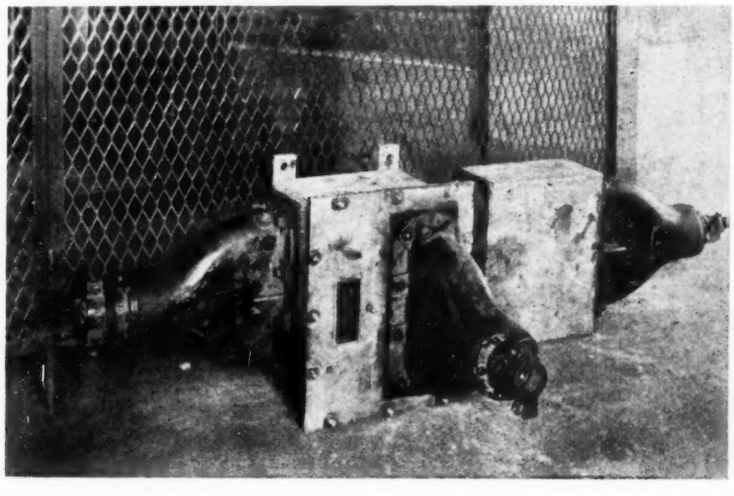
Associate Editor, Coal Age

Installing 2,300-Volt Banded-Armor Cable in Trench Dug by Cutting Machine

OPENING a brand new mine to load mechanically 6,000 tons per shift, and to separate this product on the surface into clean coal, and reject in the approximate ratio of five to one, presented an opportunity for considerable pioneering in electrical and mechanical design. Accordingly, Wildwood embodies several new features. The underground conductors of 2,300-volt power are buried in trenches and installed in sections with plugging-in receptacles for convenience in making taps and extensions; inside substations are truly portable; an electrical differential replaces the conventional mechanical differential on the drive of the main-slope belt conveyor; and new principles have been utilized to substitute electricity satisfactorily in place of air for operating the rotary dump.

Utility, safety, reliability, and economy of operation were weighed carefully in the entire electrical and mechanical design of the plant. On the outside, every conductor of the power, signal, and telephone systems is carried in a trench or conduit, and the motors and controllers of all inside equipment are of the explosion-tested type.

Illustrating Assembly of Plug Box Between Section Plugs and of Feeder Plug to Portable Substation



Power is purchased from the Duquesne Light Co. at a present net cost of less than one cent per kilowatt hour. This unit cost will decrease as the mine is developed to full capacity. A generating plant to utilize the bone coal as fuel was given serious consideration, but was ruled out in the final analysis. The demand portion of the monthly power bill is computed from a measure of the maximum kilovolt-amperes registered in a 15-minute interval.

At the power company's step-down station, which is within about 1,000 ft. of the tipple, the coal company erected a small brick building containing a 2,300-volt main panel and three distributing panels. In addition to oil switches with overload trips, the latter panels include meter-

ing equipment which indicates distribution and provides a means of checking the total. One of the circuits feeds the mine fan, another the underground substations, and the third goes to a distribution board feeding the top plant.

These circuits are in armored cable buried in trenches and without further conduit protection. The following specifications for the cable feeding the underground substations are typical of the others excepting for size: 3-conductor, 400,000 circ.-mil, $\frac{3}{64}$-in. varnished cambric on each conductor and a belt of the same material and thickness around the three; $\frac{9}{64}$-in. lead, jute double-banded steel armor of 0.022-in. ribbon, and a jute covering over all. This is the same size and type as the cable used in the mine. The section of this mine-feeder circuit passing down through the 240-ft. airshaft has wire instead of ribbon armor. This armor consists of twenty-one No. 4 B.W.G. galvanized steel wires with a serving every 25 ft. The suspension clamp is that of the Standard Underground Cable Co.

Total connected horsepower of the plant is 3,982. Briefly, this is made up as follows: Fan, 200 hp.; slope hoist for handling material, 200 hp.; drive of main belt conveyor, 325 hp.; crusher, 150 hp.; motor-generators in mine, 1,430 hp.; Peale-Davis cleaning plant, 1,090 hp.; tipple and other miscellaneous motors, including rotary dump, main pump, and dust blower at bottom of slope, 462 hp.; and a.c. lighting, 125 hp.

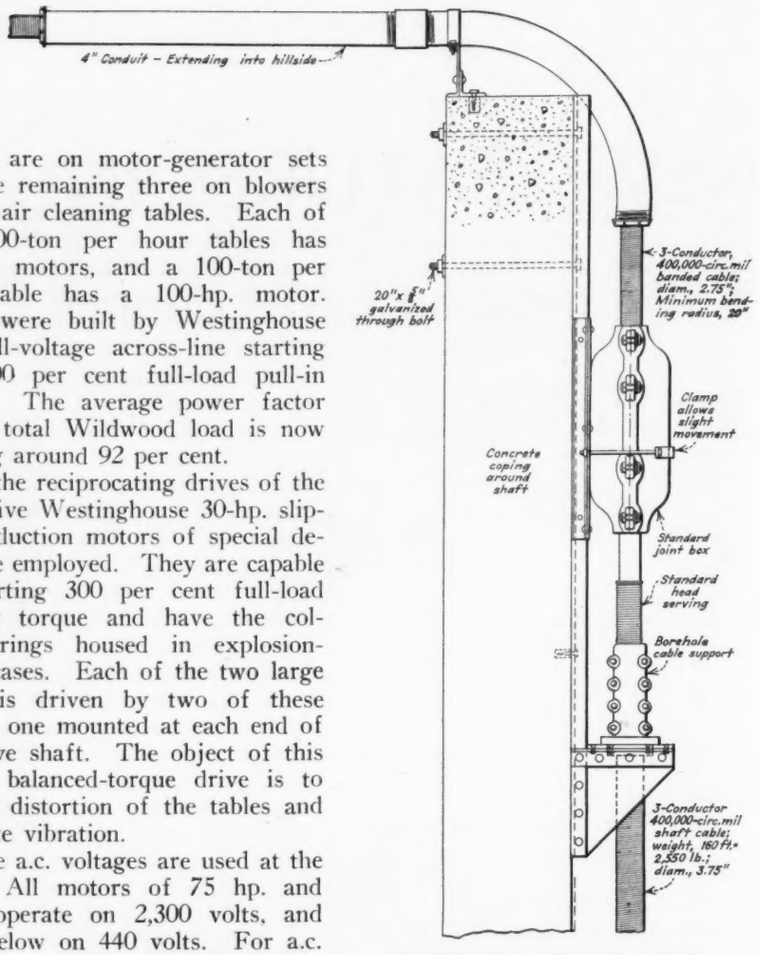
Of the total, there is 2,190 kva. of 80 per cent power factor synchronous motors. Four of these motors are on motor-generator sets and the remaining three on blowers of the air cleaning tables. Each of two 300-ton per hour tables has 200-hp. motors, and a 100-ton per hour table has a 100-hp. motor. These were built by Westinghouse for full-voltage across-line starting and 100 per cent full-load pull-in torque. The average power factor of the total Wildwood load is now running around 92 per cent.

For the reciprocating drives of the tables five Westinghouse 30-hp. slip-ring induction motors of special design are employed. They are capable of exerting 300 per cent full-load starting torque and have the collector rings housed in explosion-tested cases. Each of the two large cables is driven by two of these motors, one mounted at each end of the drive shaft. The object of this duplex balanced-torque drive is to prevent distortion of the tables and eliminate vibration.

Three a.c. voltages are used at the mine. All motors of 75 hp. and above operate on 2,300 volts, and those below on 440 volts. For a.c. lighting and for the small motors on blowers of steam heating units in buildings, 220 volts is used. Three 333-kva. transformers feed the 220- and 440-volt circuits.

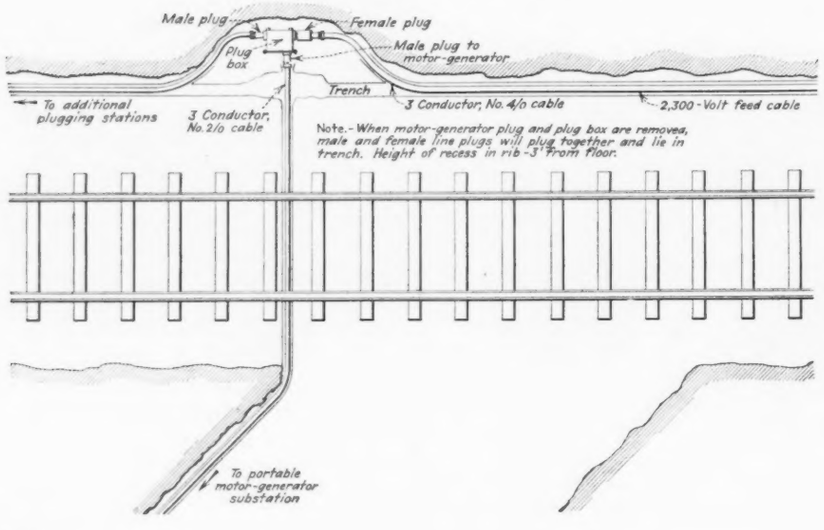
On page 282 is a schematic sketch of the unusual drive of the 750-ton per hour slope conveyor, which is 900 ft. long between centers of head and tail pulleys and is equipped with a 12-ply 54-in. belt. The driving is done by two pulleys of equal diameters which engage the return run of the belt. Pulley No. 1 is driven by a 250-hp. 587-r.p.m. slip-ring induction motor and No. 2 by a 75-hp. 585-r.p.m. motor of the same type. The drive connection ratios are exactly the same to both pulleys, so it is evident that pulley No. 2 will rotate a slight bit slower than No. 1.

This unequal speed is necessary because the belt is under maximum tension and is stretched the most at the point where it first makes contact with pulley No. 1, and has contracted by reduction in tension before it comes in contact with pulley No. 2. The change in length due to this contraction varies with the load on the belt, so the difference in speed of the two pulleys must also vary. Instead of using a differential gearing to allow a change in speed and preserve a fixed ratio in driving powers, as is accomplished by the differential of an automobile when turning a corner, the motor characteristics are of suf-

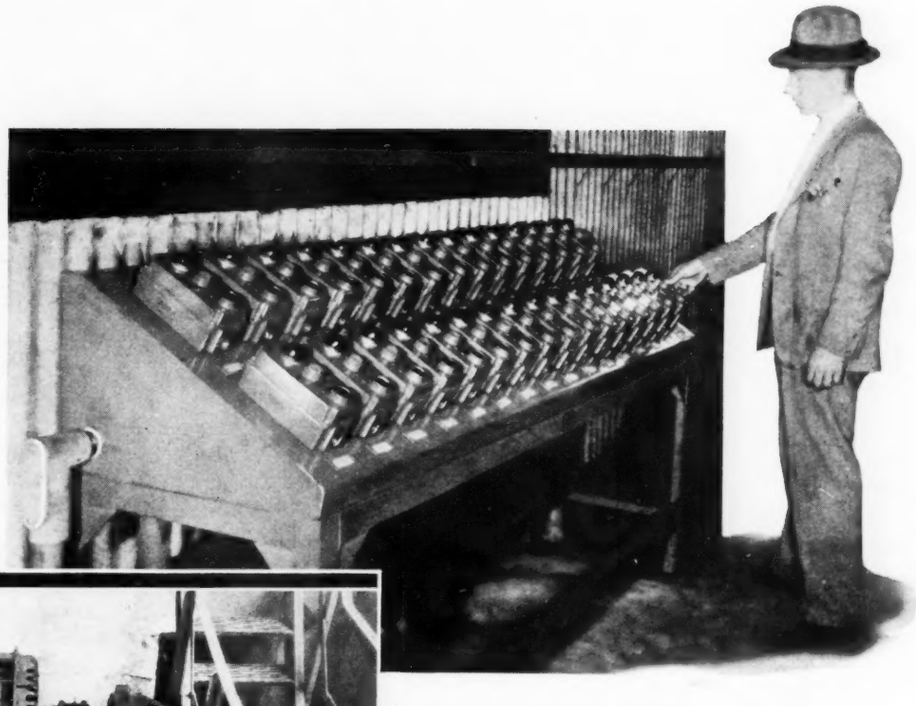

4" Conduit – Extending into hillside
20"x 6"x ⅝" galvanized through bolt
3-Conductor, 400,000-circ.mil banded cable; diam., 2.75"; Minimum bending radius, 20"
Clamp allows slight movement
Concrete coping around shaft
Standard joint box
Standard head serving
Borehole cable support
3-Conductor 400,000-circ.mil shaft cable; weight, 160 ft.= 2,550 lb.; diam., 3.75"

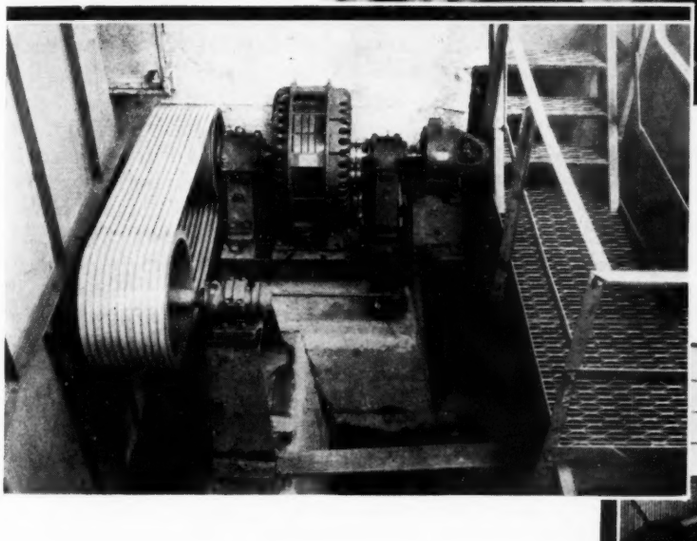
At Joint Box Above the Shaft Suspension the Banded-Armor Trench Cable Is Connected to the Wire-Armor Cable

Portable Substations Are Connected by Inserting Plug Box Between Section Plugs of Trench Cable


Male plug
Female plug
Plug box
Male plug to motor-generator
Trench
To additional plugging stations
3 Conductor, No. 2/0 cable
3 Conductor, No. 4/0 cable
2,300-Volt feed cable
Note.- When motor-generator plug and plug box are removed, male and female line plugs will plug together and lie in trench. Height of recess in rib -3' from floor.
To portable motor-generator substation

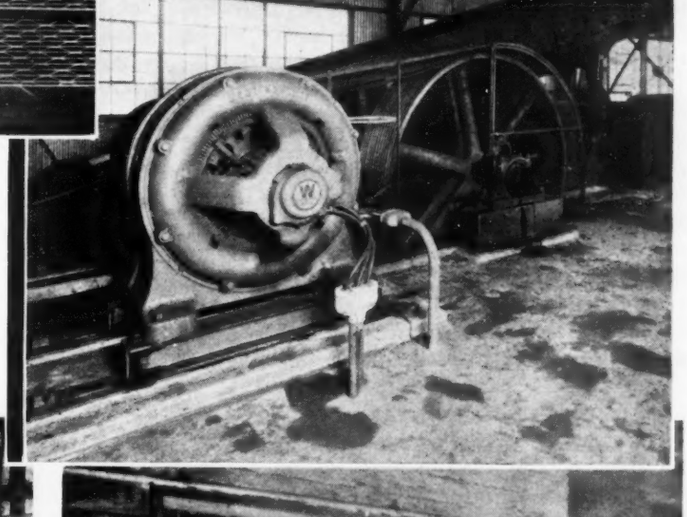
Lamps on Each Push Button Station of the Cleaning Plant Control Board Indicate if the Respective Motor Is Operating





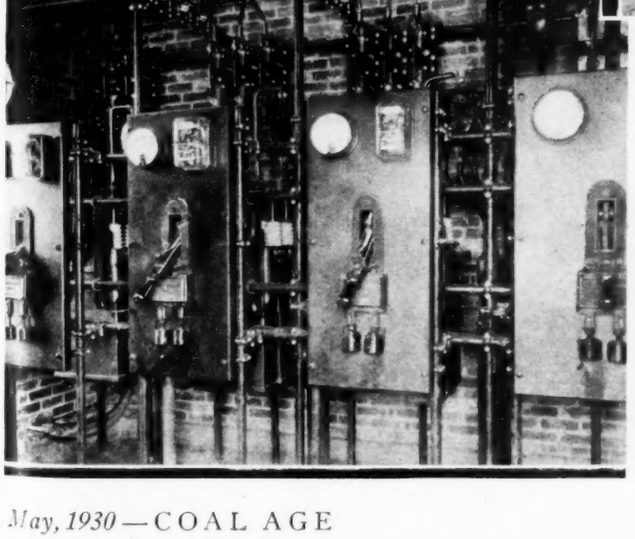
Synchronous Motors Driving Table Blowers in the Cleaning Plant Correct Power Factor

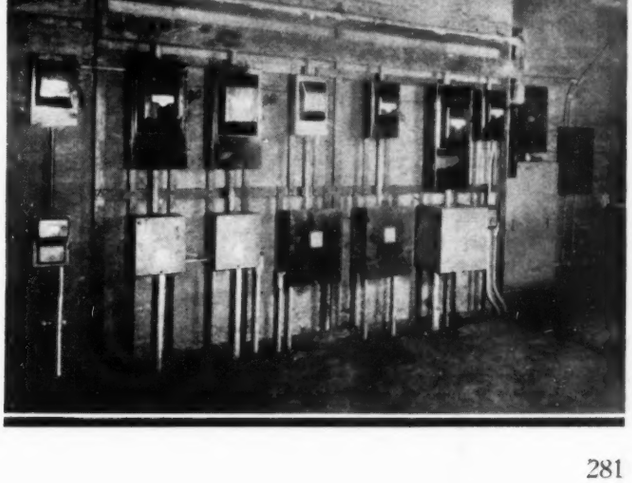
The Small Motor at Right Drops in Speed More Than the Large Motor as the Conveyor Belt Load Increases

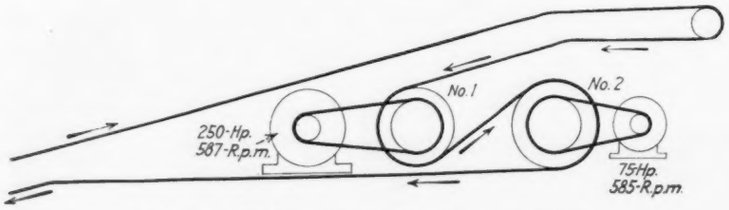


Bottom, Right—Rack With Steel Box Along Top Provides Simple Arrangement for Safety Switches and Starters at Bottom of Main Slope

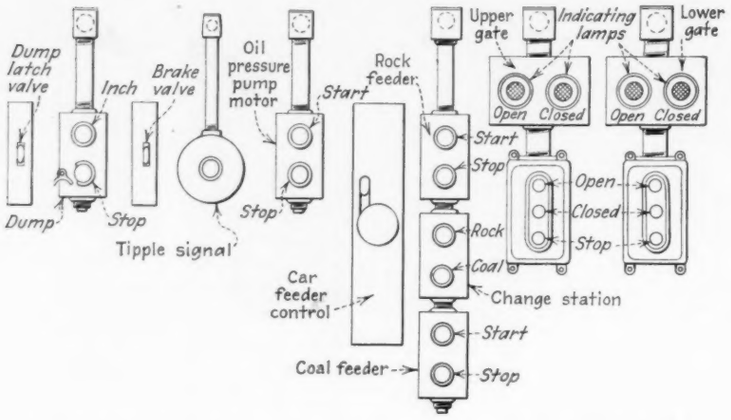
Bottom, Left—A Main and Three Distributing and Metering Panels Are Installed Adjacent to the Power Company Transformer Substation







Electrical Differential of Main Conveyor Drive



Lamps Indicate the Rock and Coal Gate Positions and a Change Button Interlocks the Feeders on the Dump Control Board

ficient difference to give the same result. Sufficient resistance is provided in the secondary circuit of the smaller motor to cause it to drop in speed slightly more with load than does the larger motor.

The controllers of each motor have the same number of accelerating contactors and the pairs of contactors are actuated in unison by one timing relay. Pulley No. 2 is merely an idler to enforce a large arc of contact between the belt and driving pulley No. 1. This contact is made more effective by keeping a small driving torque on pulley No. 2 to minimize the tendency for the belt to slip on pulley No. 1. The electrical differential represented a considerable saving in first cost over a mechanical arrangement and is probably less liable to serious breakdowns than the mechanical.

Westinghouse equipment is used on the conveyor innovation and also on a new method of automatic rotary dump drive. Differences in car loading, changes in temperature, brake wear, and other variables had previously balked efforts to secure accurate automatic control by electricity. The problem has been solved to the degree that the Wildwood dump stops in normal position with sufficient accuracy.

Mine cars weighing 5,700 lb. and loaded with 5 tons of coal are dumped one at a time by successive complete revolutions of the dump in the same direction. The drive is a type MP 30-40-hp. compound-wound d-c. mill motor connected through a Jones speed reducer. Slowing the dump momentarily to allow the coal to "ease out" instead of being thrown out, and slowing again at the end of the revolution, is done automatically by armature shunt control of the motor. By this method the series field is kept at high value while the armature current is reduced by reason of a resistance connected into a circuit shunting the armature. The speed of the motor must drop to correspond to the armature current.

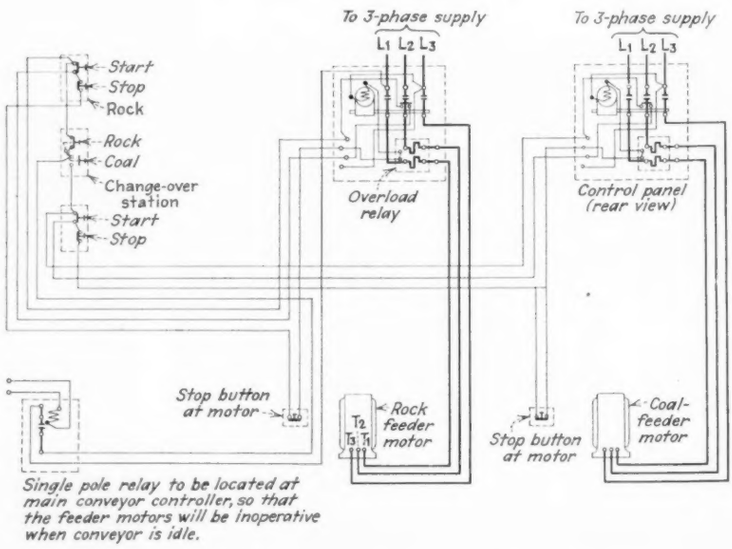
The final stopping is effected by a magnetic brake on the motor shaft. A condenser is placed across the contacts of the limit switch in order to snuff out the arc, promptly, and thus avoid time variations in opening of the motor circuit contactor, and in the setting of the magnetic brake. This condenser is an indispensable feature of the control.

The dump starts automatically when the dumper moves an oil valve lever, which in turn releases a dog that locks the dump in normal position. Stopping of the car feeder to spot cars in the dump is a manual operation. On the dump and car feeder control board are push buttons controlling a motor-driven rock gate and coal and rock feeders. These are interlocked so that both feeders cannot be operated to deliver both coal and rock onto the belt at the same time.

Push-button control is used for all motors driving top works equipment, and each button is equipped with a pilot light to indicate if the respective motor is running. In both tipple and washer the push-buttons are grouped on one sloping control board designed especially for the duty. The indicating lamps are across the 440-volt motor leads and in series with individual resistance units mounted in the base of the control boards.

Safety switches are used throughout the plant, and all wiring is in rigid conduit. Where a number of safety switches and starters are grouped on one rack the 440-volt feeder busses are of bare copper housed in a long steel box. This is

Change-Over Push-Button Station Interlocks Controls of Rock and Coal Feeders to Main Belt



Single pole relay to be located at main conveyor controller, so that the feeder motors will be inoperative when conveyor is idle.

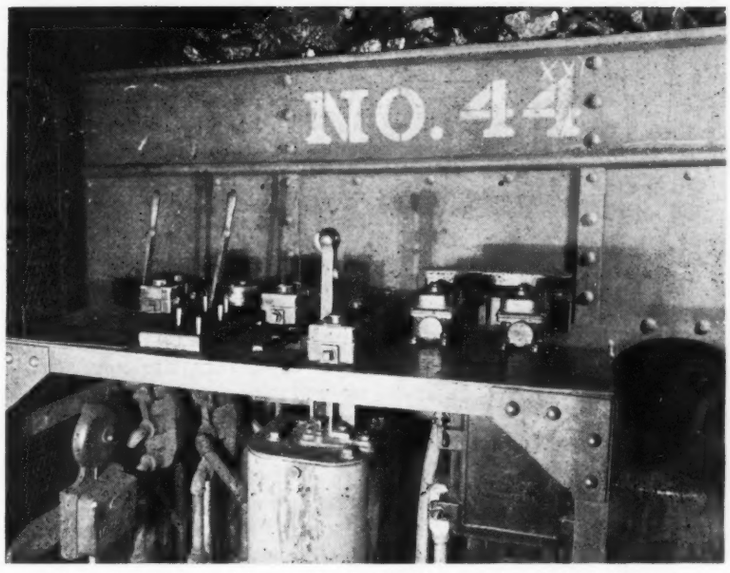
ideal construction from the standpoint of simplicity and accessibility yet affords complete protection.

All motors are provided with stop buttons located at the motor, to allow locking out for safety to inspectors and repair men.

Inside electrical equipment has been designed to fit in with the concentrated mining made possible by complete mechanization, and a unique plan of driving all rooms abreast in a panel and bringing back the pillars in the same way. All room and pillar coal will come from two adjoining room panels.

These panels are embraced in a mine section of approximately 80 acres, which will produce about 5,000 tons of coal in eight hours. In this area a comparatively large number of machines will be in operation simultaneously during the main working shifts. This high degree of concentration on the one hand necessitates, and on the other provides an opportunity for the shifting of d.c. power supply with the mining advance, through portable substations.

This 275-volt d-c. load will be carried by three General Electric 300-kw. synchronous motor-generator sets with full automatic control, one situated in a permanent location about 1,500 ft. from the dump, and the other two in temporary locations adjacent to the panels being mined. These portable substations, described in the April issue *(Coal Age,* Vol. 35, pp. 229-231), consist of three units each, mounted permanently on separate mine trucks. The motor generator is on one, the starting and running switches and auto-transformer on the other, and the control panels, control transformer, and incoming line oil switch on the third.



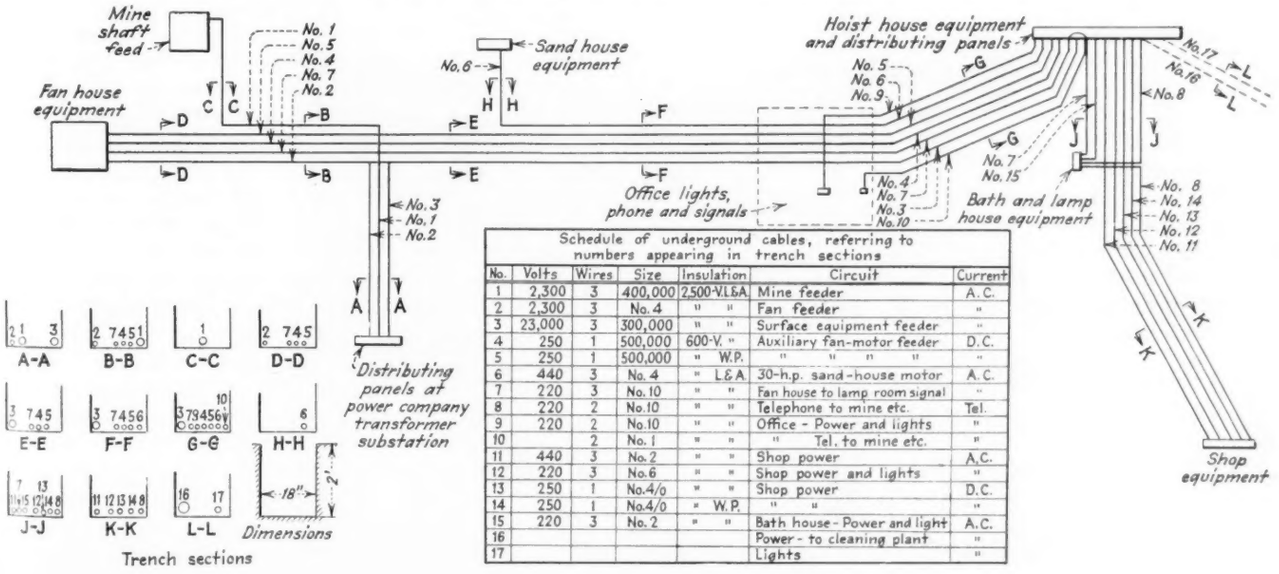
The Dump Control Board Faces Car Next to One Being Dumped

All connections between the three trucks, excepting the 1,250,000-circ.-mil d-c. leads, are made with plugs and receptacles. Dossert connectors are used on the d.c. leads. The trucks are left on the track and the group is housed in a building or box erected by bolting together sections of $\frac{3}{8}$-in. asbestos board, each framed with light angle iron. The side sections are 3 ft. x 6 ft. 6 in. and the top sections 3 ft. x 5 ft. $9\frac{1}{4}$ in. A 6-in. layer of crushed limestone is put on the mine bottom to form a floor in the building or box.

As the mining progresses to panels successively distant from the beginning on the face entry, the two portable substations are to be moved forward by jumps of 350 ft., or the distance between room entries. They are to be operated 350 ft. apart, which means that each move will be 700 ft. The rear substation will be moved around the other and to the leading position each time.

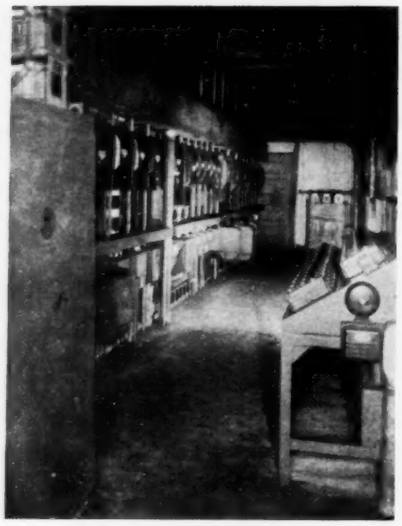
The 400,000-circ.mil, 3-conductor, 2,300-volt armored cable feeding substations is in 350-ft. lengths. It is buried in a trench along the track and the sections are joined by waterproof pothead plugs and receptacles. When a substation is to be connected at a joint, a waterproof box is inserted between male and female connectors. The substation cable is plugged into this box. All connections are waterproof and but two of the boxes are required, because they are moved with the substation. The connectors and plugs were developed especially for the job by the G. & W.

All Top Works Electrical Circuits Are in Trenches



Schedule of underground cables, referring to numbers appearing in trench sections

No.	Volts	Wires	Size	Insulation	Circuit	Current
1	2,300	3	400,000	2,500-V.L&A	Mine feeder	A.C.
2	2,300	3	No. 4	" "	Fan feeder	"
3	23,000	3	300,000	" "	Surface equipment feeder	"
4	250	1	500,000	600-V. "	Auxiliary fan-motor feeder	D.C.
5	250	1	500,000	" W.P.	" " " "	"
6	440	3	No. 4	" L&A	30-h.p. sand-house motor	A.C.
7	220	3	No. 10	" "	Fan house to lamp room signal	"
8	220	2	No. 10	" "	Telephone to mine etc.	Tel.
9	220	2	No. 10	" "	Office - Power and lights	"
10		2	No. 1	" "	" Tel. to mine etc.	"
11	440	3	No. 2	" "	Shop power	A.C.
12	220	3	No. 6	" "	Shop power and lights	"
13	250	1	No. 4/0	" "	Shop power	D.C.
14	250	1	No. 4/0	" W.P.	" "	"
15	220	3	No. 2	" "	Bath house - Power and light	A.C.
16					Power - to cleaning plant	"
17					Lights	"



440-Volt Circuits Leading to Safety Switches and Motor Starters in the Cleaning Plant Are Connected to Bare 440-Volt Buses Housed in the Long Steel Box at Upper Left

Specialty Co., of Chicago. They are rated 5,000 volts, 400 amp., and are doweled so that there can be no change of phase rotation.

Trenches for the cable are made with the cutter bar of the Oldroyd machine turned on edge for shearing and swung to the side position. This cuts and cleans a trench 6 in. wide and 14 in. deep. Already the main cable has undergone the test of operating under water in certain places for a considerable time. Tests have shown the mine water to be alkaline instead of acid.

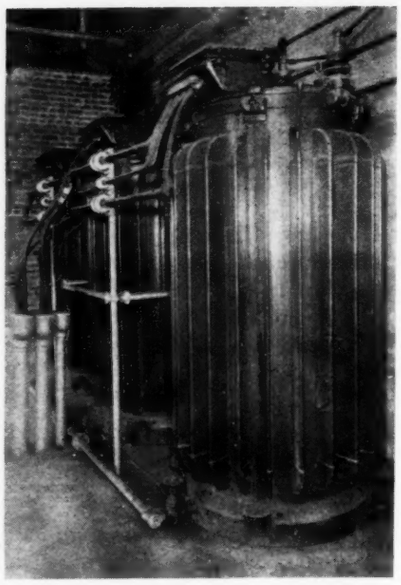
The Oldroyd loaders weigh approximately 30 tons each and are equipped with thirteen 275-volt Westinghouse explosion-tested motors, and with control equipment of the same make and type. Two 20-hp. motors drive the dipper, four of 7½-hp. drive the two four-wheeled trucks, three of 7½-hp. drive the conveyors, and one of 5-hp. raises and lowers the rear boom. The dipper motors are compound wound to assure uniform speed under load. The conveyor motors are also compound, but the propelling motors are of the series type.

The design of explosion-tested contactor control for this machine brought up a number of new problems. The load is on four separate circuits, each with a protective panel having positive and negative railway-type contactors. With this arrangement stalling of the dipper opens only that circuit and does not interrupt the other parts of the loader. The control circuits of the railway-type contactors are operated from no-voltage relays and from individual overload relays in each motor circuit of that group. The contactors are designed to interrupt circuits without fuse protection and are of the full-floating type, so as to operate without hesitation if the loading machine is out of level.

The battery locomotives are equipped with 54-cell, 39-plate lead batteries, the weight of which was included in the 9-ton rating previously mentioned. The batteries will be charged from a 100-kw. motor-generator set at the motor barn, which is located near the permanent substation. Temporarily the charging is from the 275-volt line.

All trolley wires are 6/0 size, and rail bonds are attached by electric welding, using steel electrodes.

The mine fan is driven by a 200-hp. type CW slip-ring induction motor connected through a Morse silent chain and without a disconnecting clutch. The secondary control resistance of the motor is of sufficient capacity to provide reduced speed operation. Connected through a friction clutch and silent chain is an auxiliary motor which formerly was used as a 100-kw. d.c. generator at another mine of the company. A similar generator is installed at the slope hoist house with a 165-hp. gas engine drive. This arrangement provides auxiliary fan power and a spare driving motor.



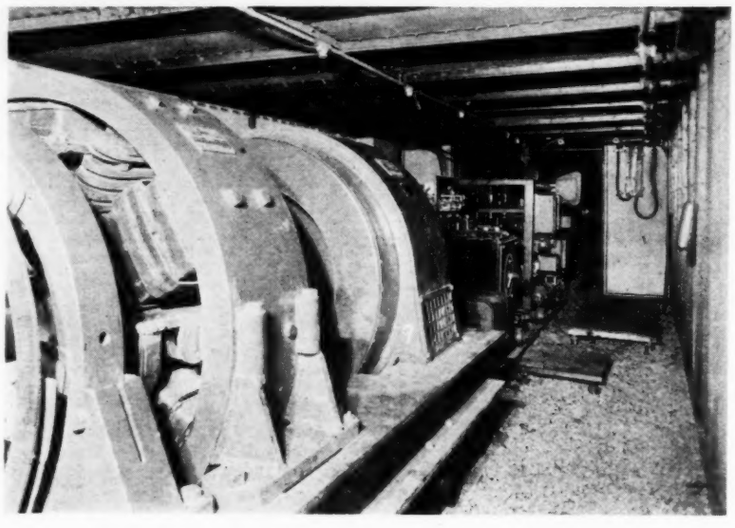
Three 333-Kva. Transformers in the Slope Hoist House Supply 440 and 220 Volts for Top Works Motors Under 75 Hp. and for Lighting

Most of the motor drives of the plant are Texrope belts, but there are several gear reducer drives besides that on the rotary dump.

Considering the large capacity and the fact that all operations are mechanized, it is of interest to note the size of the outside shop that has been provided. A brick building 55 x 240 ft. is partitioned crosswise into the following rooms: warehouse, 60 ft.; electric shop, 40 ft.; machine shop, 40 ft., and blacksmith shop, 100 ft. All repairs to heavy inside machinery, except general overhauling, will be done in the mine.

A. L. Lee, now in operating charge of electrical and mechanical equipment at the plant, was in direct charge of electrical design and installation for the Allen & Garcia Co.

On the Track in a Crosscut and Housed in an Asbestos Building With Crushed Limestone Floor Is a Portable Substation



VENTILATION IDEALS

+ Made the Goal

At Wildwood

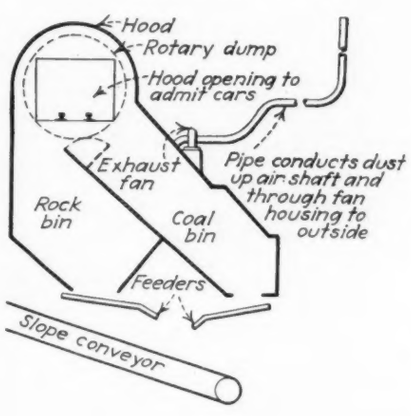
WHILE greater use of machinery underground tends to simplify mine ventilation by increasing the speed of coal extraction and by concentrating the workings, at the same time it demands greater alertness and exactness in the ventilation methods. In mechanical mining, cautious eyes must follow every foot of face advance and the breaking through of every crosscut, as a few of a multitude of details requiring the closest attention. This is a task of no mean order, because places are advanced so rapidly by machine that mental impressions of the status of working places from shift to shift, if they could be projected, would appear as a moving picture.

There is no exaggeration in this comparison if it is applied to the Wildwood mine. Entries are double-shifted; sometimes they are triple-shifted. A face is advanced one 9-ft. cut each shift usually, and two or more cuts if need be, so that the total advance of a face in 24 hours could range up to, say, 54 ft. or even more. The advance of headings and crosscuts is now at the rate of about 3 miles per month. So fast do faces move forward that foremen would be somewhat puzzled by the strangeness of a heading end if some means were not provided to keep him informed. This is done by requiring the shift foremen of each section to post on a map the progress of every place during their respective shifts.

Machinery has and must always be recognized as a possible source of gas or dust ignition underground. And as mechanization means intensification of the hazard by the introduction of more electrical units, the factor of safety in ventilation must be stepped up accordingly. Every machine must be protected by the reading of a flame safety lamp, and if gas in dangerous quantity is encountered, great financial loss is sustained by even temporary forced idleness of machine and men while the accumulation is being removed. For a production of about 3,000 tons daily at Wildwood, 35 flame safety lamps are used during each working shift. Safety in general and ventilation in particular constitute a force greater than desire for tonnage or low production cost in the control of these operations.

This mine is ventilated by a 7x11-ft. primary exhaust, reversible fan which is designed to deliver 300,000 cu.ft. of air per min. against a water gage of 3 in. at a speed of 140 r.p.m. At present it is delivering 125,000 cu.ft. at 1.1 in. of water gage. The performance of this fan is charted by a continuous pressure recorder. The fan is driven by a 200-hp., 2,300-volt variable speed motor. The standby drive is engaged with the fan shaft through a clutch. This unit is a 100-kw. generator used as a motor, which is energized by a duplicate generator driven by a 165-hp. natural-gas engine.

Fig. 1—Underground Dust-Collecting System at the Rotary Dump



The cross-section of the airshaft is an oblong with rounded ends and measures 13x32 ft. inside. The curtain wall divides this shaft into a downcast compartment with a cross-sectional area of 144 sq.ft. and an exhaust compartment with a cross-sectional area of 289 sq.ft., 40 sq.ft. of which is taken up by a stairway. The lower compartment of the slope is devoted to the handling of materials and equipment by rope haulage. This opening has a cross-sectional area of 72 sq.ft. and serves as an intake. Curved steel deflector plates will be installed at the upper and lower extremities of the shaft to ease the change of direction of air flow from the vertical to the horizontal, or vice versa, and thus minimize turbulence and consequent resistance.

The upper compartment of the slope accommodates the coal conveyor

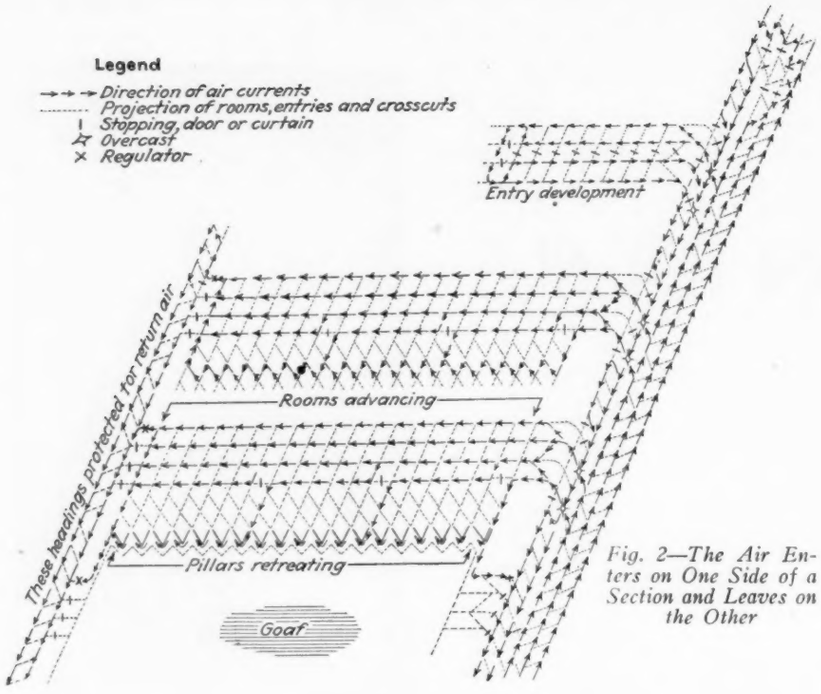


Fig. 2—The Air Enters on One Side of a Section and Leaves on the Other

and a stairway for man travel. With the slope bottom, this compartment is shorted from the ventilation system. Air in this quiescent zone is renewed through regulators.

Coal dust put into suspension during the emptying of cars by the rotary dump at the slope bottom is drawn downward into the coal compartment of the dump bin by a small exhaust fan. This fan is installed below the dump and directly over the bin, to which it is connected by pipe, as shown in Fig. 1. After passing through the fan, the dust is sent through a 12-in. pipe to and up the airshaft. The dust is not exhausted into the return but is conducted all the way to the outside by the pipe. The dump is inclosed by a hood with a door at each end only large enough for the passage of cars through it.

The main entry, running east and west across the property, has six headings. Three of these are on the intake and three on the return. Face entries each consist of five headings, three being intakes and two returns. Chain pillars between intake and return headings are broken by as few crosscuts as possible, in order to minimize air leakage. The interval between crosscuts in the dividing pillar is 360 ft. on the main entry and 180 ft. on face entries. Stoppings for use on the main and face entries are constructed of concrete masonry. Stoppings on room entries are made of concrete blocks and lime mortar. This type of construction permits these stoppings to be demolished readily and allows salvaging of the blocks for re-use.

Doors are used only during development and overcasts are constructed immediately when needed. The doors are cut and framed in the surface shops and sent into the mine ready for erection.

Blower fans for auxiliary ventilation are not utilized in this mine. Where necessary, faces are ventilated from the last open crosscut by line brattice. The brattice is not supported by props, in accordance with the practice at most mines. Holes of 1½-in. diameter, 6 in. deep are drilled in the roof for the reception of white pine plugs from which the brattice is hung. The holes are drilled by a hand post-drill which is mounted on a 2-in. pipe. The thread bar of the drill projects into the pipe. The tip-to-tip length of the drill and pipe mounting is made slightly shorter than the mean height of the roof.

This method of suspension has been found to give satisfaction and to eliminate two hazards growing out of supporting brattice by props. If the brattice is hung from the roof, it will give and is not likely to be torn down when crowded by a machine. Its flexibility will eliminate the danger of a man being caught by a passing mine car. Men are known to have been caught between a car and a prop hidden by the brattice.

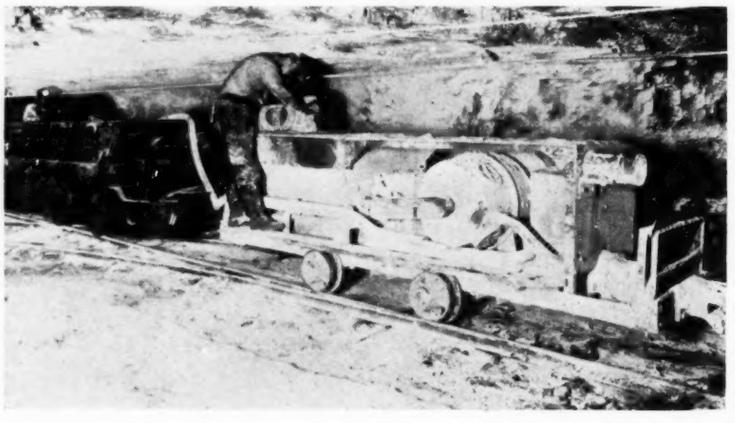
Each section is on a separate split. As illustrated in Fig. 2, all four headings comprising a panel entry are intakes. The air sweeps across a section through the panel places in one direction only, entering on one side and leaving on the other. By this arrangement, with no doors and with no return on a panel entry during the mining of rooms and taking of pillars, a positive pressure may be maintained against the goaf.

Mined-out panels will be ventilated and bled through regulators until all in a section are extracted. Then that section will be severed from the active workings by seals. As practically all of the production will come from one section, adherence to this plan is virtually equivalent to the starting of a new mine every time a section is abandoned and the origin of production is transferred to a new section. Ventilation troubles will be left behind in the goaf.

Cutting, loading, and drilling machines installed at Wildwood are exclusively of the permissible type. So are the storage-battery locomotives which will be used in pulling pillars. A minimum of 10,000 cu.ft. of air is delivered to the last crosscut of a split. The maximum quantity of methane in the return at the bottom of the airshaft has been 0.13 per cent.

Ribs, roof, and floor of all places are coated with rock dust, which is kept no farther than 40 ft. from any advancing face. In entries 8 to 10 lb. is applied per linear foot. A greater unit weight will be applied in rooms.

Rock-Dusting Is a Continuous Operation, So Swiftly Are Faces Advanced



PREPARATION PLANNED

+ To Satisfy Specialized Markets

By Wildwood

By IVAN A. GIVEN

Assistant Editor, Coal Age

A UNIFORM PRODUCT able to enter specialized markets is the objective of the preparation facilities at the new Wildwood operation of the Butler Consolidated Coal Co. Coal from Wildwood mine will go to the northern region of the United States and to Canada, and will be used in the manufacture of byproduct coke and producer gas; for steam raising where special stoker coals are required; and for domestic heating. With the coal-loading operation in the mine completely mechanized, all the material blasted down goes to the preparation plant, greatly increasing the difficulty of obtaining a uniform product. This, together with the fact that Wildwood coal must be able to meet any competition, had a major influence on the choice of preparation equipment.

Wildwood marks a forward step in preparation, in that no attempt will be made to remove any impurities from the coal underground. The whole of the cleaning process is centralized in the surface plant (see Fig. 2, page 277 of this issue), which consists, broadly, of the tipple and air-cleaning plant, with a raw-coal storage bin between. Such centralization is expected to insure the quality of coal required and to reduce production costs by allowing the underground loading operation to proceed without interruption.

The capacity of the preparation plant is 750 tons of rock, coal, and bone per hour. Of this 750 tons, 715 tons normally is mine-run coal, of which 45 per cent is lump of 4 in. and over and 54 per cent is coal under 4 in. The additional 35 tons to make up the total of 750 is pure rock and/or pure bone. All coal of 4 in. and over is hand-picked in the tipple, while the minus 4-in. coal, plus the crushed impure coal and bone from the picking tables, goes to a Peale-Davis air-cleaning plant for treatment.

Fig. 1—Loading Railroad Cars Under the Tipple at Wildwood

Results to be obtained in cleaning Wildwood coal are dependent upon the wishes of the purchaser, as the primary objective of the management is to supply a fuel with as low a per cent of impurities as the customer wants, down to the practicable limits of washability. However, preparation will go even further to insure that the coal shipped for any particular purpose shall be uniform. Once the buyer decides on the coal he wants, cleaning will be so controlled that every shipment will be the same. It may be seen, therefore, that cleaning at Wildwood will not be done to any one definite set of limits on any of the sizes made. But before the plant was built, tests were made to determine the impurity content of the raw coal and the washing limits, and operation during the adjustment period, now going on, shows that, if desired, the limit of practicable results can be attained.

Operations at the Wildwood mine are in the Thick Freeport seam, admittedly one of the most difficult in western Pennsylvania to clean mechanically, because of the small spread between the specific gravity of the coal, which is low, and that of the refuse. The Freeport seam, with an average thickness of about 7 ft. in the Wildwood mine, contains a middle band of refuse 12 to 14 in.

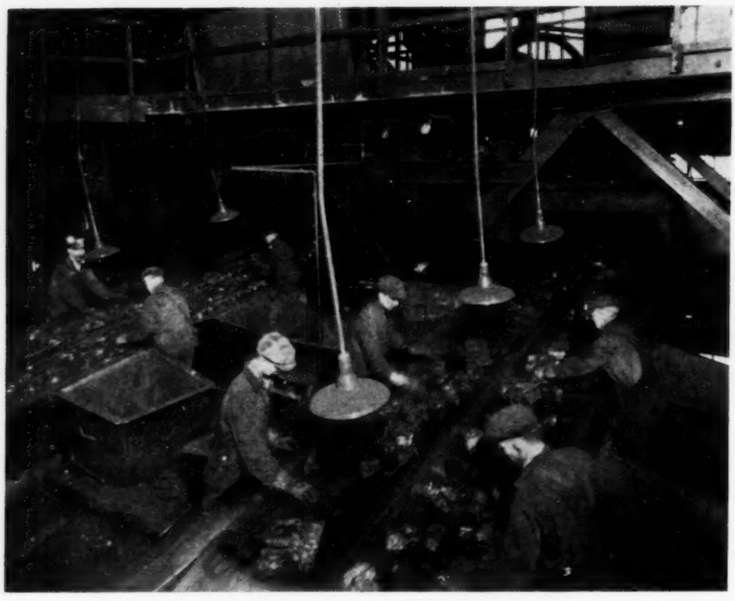


Fig. 2—Shaking Picking Tables for Cleaning Lump

thick, of which the lower six inches usually is pure bone. The upper part consists of a mixture of impure coal and bone, called "boney" by the miners. Pyrites is present in small lenses or granular particles. Some pure rock gets into the coal during loading, but most of that sent to the surface comes from excavations for placing equipment or laying track.

Mining at Wildwood calls for a machine cut in the "boney," as well as a shearing cut, both made by the same machine without moving out of the place. Naturally, the cuttings will then consist of both good coal and "boney," and the product loaded by the loading machine will include good coal, "boney," and bone. Blasting causes the latter to break up in blocks free from the coal. With full mechanical loading, no opportunity is afforded for separating the bone, "boney," and good coal without radical and time-wasting changes in the mining system, with the result that the preparation plant is called upon to handle the total run-of-mine production.

The bone and "boney" furnish by far the most difficult problem of removal. Because the gravities of the coal and bone and "boney" are so nearly equal, the problem of separation to the desired impurity limits, without too great loss of marketable coal to the refuse bank and too large a percentage of impurities in the cleaned coal, was one of major importance. As a solution, the addition of a second Peale-Davis table and the splitting of the coal sent to the air-cleaning plant into two size classifications—4x$\frac{3}{4}$-in. and $\frac{3}{4}$x0-in., the latter of which is treated on a second table—was recommended. This departure from the usual Peale-Davis system (in which all sizes are treated on the same table) will be discussed more fully in subsequent paragraphs.

Double assurance that the loss of marketable coal to the refuse bank will be cut to a minimum is embodied in the crushing facilities installed in the tipple, where the lump is hand-picked. Rock and impure coal thrown off the tables is classified, the former going to the rock bin and the latter to a crusher. From the crusher, the impure coal is sent to the air-cleaning plant for treatment. Closer inspection of the lump product is made possible by the use of this system, as the picker is not called upon to decide whether to send a lump with some impurities sticking to it to the railroad car, or whether to sacrifice the good coal by sending the lump to the refuse bank. Everything with any impurities adhering to it is sent to the crusher and from there to the air-cleaning plant, both conserving the coal and insuring purity of the lump shipments. As pure rock alone is thrown out in hand-picking, the only loss of merchantable coal is in the refuse from the air-cleaning plant, which, while it will vary with the percentage of impurities in any particular shipment of coal, usually is only a small percentage of the total input.

Flat picking tables, shown in Fig. 2, are used in the Wildwood tipple, primarily because they reduce the number of men required and, consequently, the labor cost. Two tables are employed, both twice the usual length, thus insuring complete inspection of each lump on its way to the loading boom. The tables are constructed with a ridge in the middle to divide the stream of coal equally among the men stationed along them.

Three major sizes — 4-in. lump, 4x2-in. egg, and 2x1$\frac{1}{4}$-in. nut—are loaded over loading booms. Hand-operated gates enable the boom operative to drop coal from the loaded railroad car to the following car without spillage or without stopping the operation of the tipple. Six primary sizes may be loaded in the tipple. A mixing conveyor extending across all four of the tipple tracks makes it possible to load all combinations of these six by percentages by setting the bin gates to control the flow of coal.

In addition to provisions for insuring a quality product, the Wildwood preparation plant is designed to incorporate the maximum of flexibility. Ordinarily, only run-of-mine coal and rock come to the slope bottom, though, according to plans, bone may at times be loaded out apart from the other two. Coal cars are dumped into a 25-ton bin, and rock cars are dumped, by opening a gate in the chute to the coal bin, into a separate bin. Both bins are equipped with feeders and both feed onto the belt conveyor going to the tipple. By controlling the feeders, however, coal and rock may be separated on the belt, and the rock diverted into the rock bin by opening a gate in the discharge chute in the tipple. A second gate in the discharge chute in the tipple also may be opened, allowing the mine bone to be run into a separate bin, whence it goes to a crusher and then either the cleaning plant or to the railroad cars; generally the latter.

FROM the chute the run-of-mine coal goes to a shaker screen, where the 4-in. lump is screened out and sent to the two picking tables. Minus 4-in. coal from the shaker screens generally goes to a raw-coal storage bin, and from there to the air-cleaning plant, though it may be loaded directly into the railroad car if desired. Lump from the picking tables goes directly to the loading booms, as a rule, though it may be discharged into the mixing conveyor for mixing purposes or for routing to the local trade bin. Clean lump from

the picking tables may also be crushed if desired, and then resized or sent to the mixing conveyor for loading into cars.

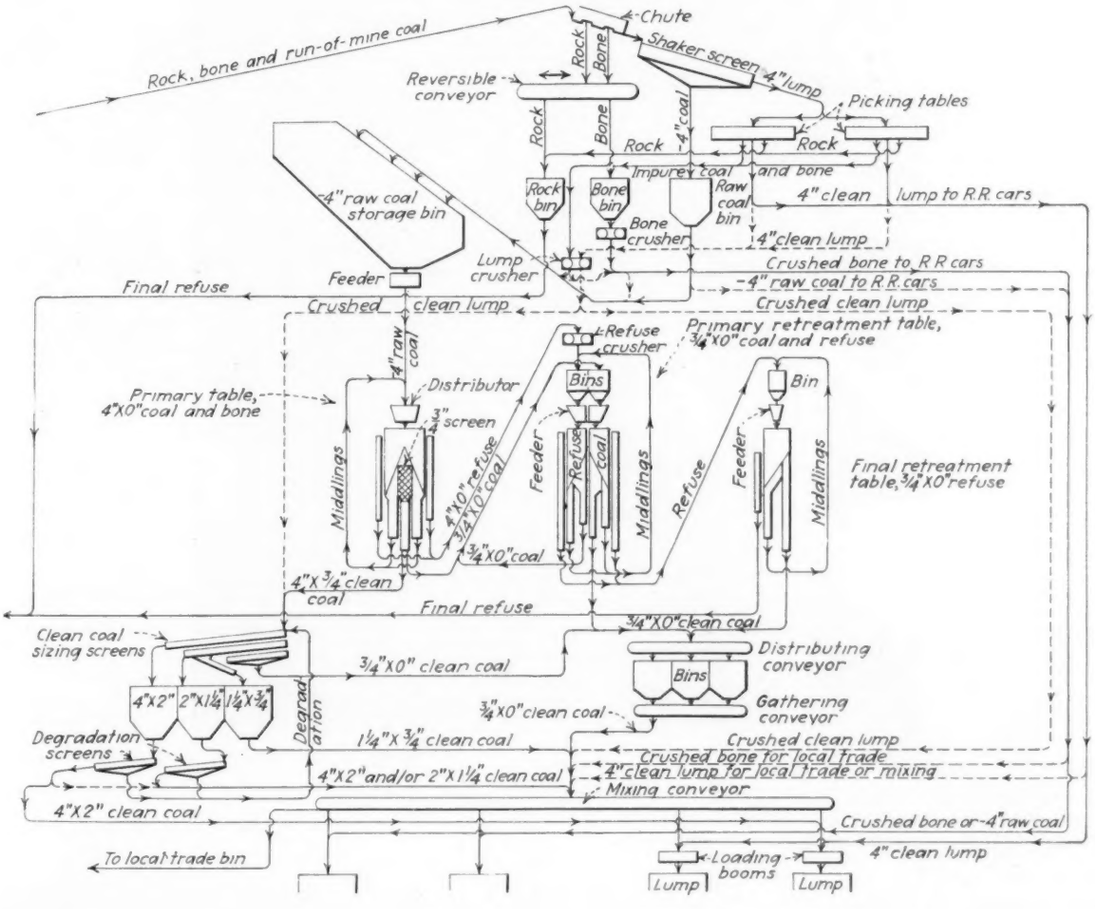
Impurities from the picking tables consist of rock and impure coal and bone. The former is sent direct to the refuse bin, while the latter may go to the mine bone bin or, as is generally the case, to the lump crushers. From there it goes to the raw-coal bin and thence to the cleaning plant. As an alternative, bone and impure coal from the tables, after crushing, may be sent direct to the railroad cars or bypassed to the mixing conveyor. Equipment for handling and loading both bone loaded in the mine and that hand-picked out of the lump coal was installed because of the fact that its high heat content—about 8,000 B.t.u.—made it suitable for use as a fuel where proper burning equipment is available.

After the preliminary sizing in the tipple, material sent to the air-cleaning plant will consist of the minus 4-in. coal and the crushed impure coal and bone from the picking tables. Between the tipple and air-cleaning plant is a 400-ton, raw-coal storage bin, which ordinarily is kept half full. As the capacity of the air-cleaning plant is 400 tons per hour, the reserve in the raw-coal storage bin will allow the air-cleaning plant to operate one-half hour after the mine or tipple stops, and also will allow the tipple and mine to operate one-half hour if the cleaning plant stops.

Raw coal from the storage bin passes to the first of three Peale-Davis air tables in the cleaning plant. Here the 4x$\frac{3}{4}$-in. size is cleaned and the $\frac{3}{4}$x0-in. size is screened out. Ordinarily, all sizes are cleaned on one table in the Peale-Davis system, but in this case, where the gravities of the coal and refuse vary only slightly from each other, tests showed that one table would not complete the job on all sizes, as it would where there is a greater difference between the gravities of the coal and refuse. Consequently, as the raw feed from the storage bin flows down the table, the refuse is drawn off from the sides. After sufficient distance is traveled to allow complete separation of the refuse above $\frac{3}{4}$ in., the coal flows over a $\frac{3}{4}$-in. screen incorporated in the table, and the small size is removed. The 4x$\frac{3}{4}$-in. size then leaves the table and goes to the clean-coal sizing screens in the tipple. The 4x$\frac{3}{4}$-in. middlings made on the primary table are recirculated. Coal screened out on the primary table goes to a bin above the primary re-treatment table. Refuse from the primary table is crushed to $\frac{3}{4}$ in. and elevated to a second bin above the primary re-treatment table.

The primary re-treatment table serves the double purpose of cleaning the $\frac{3}{4}$-in. fine coal screened out on the primary table and treating refuse from the same table to recover coal freed in crushing. The table is divided into two sections, one of which handles the fine coal and the other the refuse. Two separate feeders deliver the material from the bins. Coal of $\frac{3}{4}$-in. size from the refuse side is passed back to the fine-coal side of the table, while that from the coal side goes to the fine-coal bins. Middlings from the coal side of the table, together with those from the refuse side, are recirculated. Refuse from both sides of the table is sent to a bin above the final re-treatment table. Performance of a double func-

Fig. 3—Flow Sheet, Wildwood Preparation Plant; Certain Alternative Routes Followed by the Coal Are Indicated by Broken Lines



tion on the part of the primary re-treatment table is made possible by the fact that the sizes of both refuse and coal fed to the table are equal.

Refuse—$\frac{3}{4}$x0-in.—from the primary re-treatment table is given a final cleaning on the final re-treatment table. Final refuse from this table is sent to the bank, and the $\frac{3}{4}$x0-in. clean coal goes to the bins in the tipple. The middlings product made on this table is recirculated, as on the other two tables.

Both the primary table and the primary re-treatment table are 60 ft. long and 14 ft. wide, and each has a cleaning area of 655 sq.ft. Both of these tables have a rated capacity of 300 tons per hour, but experience has shown that the actual capacity with equally good cleaning results is about 400 tons per hour. The final re-treatment table is 55 ft. long, 6 ft. wide, and has a cleaning area of 300 sq.ft. Its rated capacity is 100 tons per hour. All three tables operate with a $2\frac{1}{4}$-in. stroke at 150-180 strokes per minute, and at an air pressure up to 4-in. water gage. Air requirements are 194,000 c.f.m. for the large tables, and 76,000 c.f.m. for the final re-treatment table.

The cleaning plant has a closed air circulation system, in which a snow fence arrangement in the last pass in the dust collectors, built directly over the tables, removes the material from suspension. The arrested dust is delivered outside the collecting chambers by screw conveyors. No dust whatever is liberated to the outer air from above the tables while still in suspension.

The large coal from the air-cleaning plant—4x$\frac{3}{4}$ in.—is conveyed to clean-coal sizing screens in the tipple, where it is separated into 4x2-, 2x$1\frac{1}{4}$-, and $1\frac{1}{4}$x$\frac{3}{4}$-in. sizes before going to loading bins. From the bins, the 4x2-in. and 2x$1\frac{1}{4}$-in. sizes pass to degradation screens before being loaded, while the $1\frac{1}{4}$x$\frac{3}{4}$-in. size goes direct to the mixing conveyor. Small coal from the air-cleaning plant also is conveyed to loading bins in the tipple and from there goes direct to the mixing conveyor and the cars without being screened.

Complete chemical control over all the products will be centralized in a room in the air-cleaning plant. Sampling conveyors will bring in all the sizes for test by the float-and-sink method. Samples for analysis will be sent to a separate chemical laboratory at the plant.

Fig. 4—Air-Cleaning Plant, Primary Table and $\frac{3}{4}$x0-in. Clean Coal Conveyor to Tipple at Left. Primary Re-treatment Table and 4x0-in. Clean Coal Conveyor to Tipple at Right; Dust Collectors Above

MECHANIZATION

+ Again in Spotlight

At Cincinnati Convention

MECHANIZATION again had the center of the stage at the Seventh Annual Convention of Practical Coal Operating Men and National Exposition of Mining Equipment, held under the auspices of the Manufacturers' Division of the American Mining Congress at the Cincinnati (Ohio) Music Hall, May 5-9. Four of the nine formal meetings of the convention were given over to discussions of progress in mechanical loading and that subject also came in for first-place attention at the opening session devoted to a review of outstanding developments in the coal industry in 1929-30.

Consideration of coal-cleaning problems was limited to a single session. Transportation and maintenance questions were discussed at another session, personnel training at still another, and safety at one session. Although held on different days, the sessions on accident prevention and personnel training had much in common.

In addition to these formal program meetings, there was a dinner conference on mining education on May 7 and a complimentary breakfast to P. C. Thomas, general manager of mines, Koppers Coal Co., who was chairman of the general program committee. Entertainment features of the convention included a home-talent show staged by exhibitors and delegates on May 7 and the annual informal dinner on the next evening. On May 7 the Westinghouse Electric & Manufacturing Co. was host to about forty maintenance men in attendance at the convention.

Over 2,500 names were shown on the official registration lists. The attendance was about equally divided between delegates from coal-operating companies and representatives of manufacturing companies exhibiting at the convention. As in the past, the exhibits of new equipment proved an outstanding feature of the convention. This equipment is discussed in detail in a review beginning on page 306 of this issue of *Coal Age*.

Up 75.6 Per Cent!

The quantity of bituminous coal loaded underground by mobile machines, scrapers, conveyors, pit-cars and other hand or semi-mechanical means last year was 75.6 per cent greater than in 1928. The total tonnage so handled was 37,854,000 tons and nearly three-quarters of this amount came from mechanized mines in four states. Pit-car loading contributed the largest percentage and actual increase to the total, exceeding 1928 figures by more than 10,000,000 tons. Mobile machines led in the actual tonnage loaded and were second in rate of percentage increase.

At a meeting of the board of governors of the Manufacturers' Division, Raymond Mancha, Mancha Storage Battery Locomotive Co.; E. A. Williford, National Carbon Co.; Charles B. Officer, Sullivan Machinery Co.; and W. B. Pritchard, Bethlehem Steel Co., were elected members of the board, vice H. A. Buzby, Keystone Lubricating Co.; N. S. Greensfelder, Hercules Powder Co.; H. K. Porter, Hyatt Roller Bearing Co.; and J. C. Wilson, Ohio Brass Co. L. W. Shugg, General Electric Co. and director of exhibits, was re-elected to the board.

Fred J. Maple, John A. Roebling's Sons Co., was elected chairman of the board. Charles C. Whaley, Myers-Whaley Co., was advanced to the position of first vice-chairman, vice Mr. Maple; Ralph C. Becker, McGraw-Hill Publishing Co., moved up to the second vice-chairmanship, and John T. Ryan, Mine Safety Appliances Co., was made third vice-chairman.

In the discussion of maintenance problems at the Westinghouse luncheon, H. R. Meyer, head of the renewal parts section of the company and official host, related the efforts Westinghouse representatives are making to have maintenance instruction cards hung up at shops and to promote maintenance meetings at the mines. Such meetings have been held recently at the operations of seven different companies and others are planned.

John S. Dean, renewal parts engineer for Westinghouse, discussed the lubrication of bearings. It was his observation that the successful operation of electric locomotives and freedom from breakdowns and high maintenance costs depend in a large measure upon the bearings. Lubrication must be sufficient and dirt must be excluded to prevent rapid wear. In the lubrication of armature bearings, care must be taken to prevent damage to windings by leaking oil. Bearings and bushings, he said, should be renewed when wear

exceeds a definite standard. Charts covering the proper lubrication of all parts of every type of equipment were strongly recommended.

REVIEWING mechanization progress in 1929 at the opening session of the convention, presided over by Dr. L. E. Young, vice-president, Pittsburgh Coal Co., Pittsburgh, Pa., G. B. Southward, mechanization engineer, American Mining Congress, classified the practices and percentages of mechanically loaded coal at 230 different operations with 2,718 equipment units. He assumed that, at any mine producing 90 to 100 per cent of its coal mechanically, the system was a proved success and entitled to recognition, as Class A. Mines producing from 10 to 90 per cent of their coal mechanically, Class B, could not off-hand be termed either successes or failures, and those producing only 10 per cent or less by mechanical means should be placed in the experimental or C class, though some of them might be using machinery successfully.

The speaker placed 87 mines in Class A, 106 in Class B, and 37 in Class C. Divisions also were made as to three coal thickness: i. e., under 4 ft., 4 to 6 ft. and over 6 ft.; the mines with coal over 6 ft. and using mechanical loaders numbered in all 41, of which 17, 23, and 1 were in Classes A, B, and C, respectively, and the mines with over 6 ft. of coal and pit-car loaders numbered in all 38, of which 16, 15, and 7 were these same classes respectively. In seams with coal between 4 and 6 ft., mechanical loaders ran 2, 1, and 1 in Classes A, B, and C, respectively; and pit-car loaders 10, 6, and 4 in those same classes. Conveyors, including Duckbills, were being used in 5 high coal-seam mines, in 8 medium coal-seam mines, and 44 low coal-seam mines, their favor in the last type of mine being due to their availability for use in the lowest of coal.

O. E. Kiessling, U. S. Bureau of Mines, presented preliminary statistics of mechanical mining for 1929. The figures, subject to revision, are shown in Tables I to IV.

Eli T. Conner, consulting engineer, Scranton, Pa., discussing "Developments in Anthracite," traced the causes of the decline in hard-coal production, developments in cleaning, the use of the Schaefer lining, and scoop mining in that region. He declared that 15 per cent of the production of The Hudson Coal Co. comes from beds 20 to 30 in. in thickness and 25 per cent from beds 36 in. or less. In 1916, only 2.8 per cent of the coal mined came from beds of the lower thickness specified.

The electric shovel, declared K. A. Spencer, in charge of engineering, Pittsburg & Midway Coal Mining Co., Pittsburg, Kan., is much more efficient than one operating by steam, owing to the delays with such machinery. One electric shovel the last four months has been shoveling 92 per cent of its time, whereas a steam shovel would have shoveled only 69 per cent. Nevertheless, only 21 per cent of the time was spent in digging into the "high wall." The rest of the time was spent in swinging the shovel around, dumping the shovel content, and doing other work which goes with actual shoveling. All this suggests, said Mr. Spencer, the advantage of a unit that would dig all the time, without alternating its digging with transportation and dumping, followed by the return movement and maneuvering of the shovel for a second digging cut. This applies also to the coal-loading unit.

Yet one Kansas shovel moved in the month of October, 1929, as much as 456,170 cu.yd. bank measure, in eighty 8-hour shifts, advancing 5,590 ft. in a pit 71 ft. wide and with a coal cover 25 to 41 ft. thick with 45 per cent of the overburden so hard that it had to be shot. The big Duquoin shovel of the United Elec-

Table I—Rank of States in per Cent of Total Output, 1929

(Produced by mechanized mining, including pit-car loaders and hand-loaded conveyors)

State	Mechanically Loaded 1929	Stripped Coal 1928*	Total Mined Mechanically
Wyoming	45.5	1.1	46.6
Illinois	29.5	8.7	38.2
Utah	25.4	....	25.4
Montana	22.2	37.1	59.3
Indiana	18.7	31.1	49.8
Virginia	7.5	....	7.5
Alabama	5.3	1.5	6.8
Pennsylvania	3.0	0.5	3.5
West Virginia	2.0	0.1	2.1
Kentucky	1.3	1.0	2.3
Missouri	3.3	46.0	49.3
Kansas	....	39.2	39.2
United States	7.1	3.6	10.7

*The figure for stripping for the United States gives due consideration to the relative tonnages of 1929 and 1928, and so does not accord with the published percentage tonnage for 1928 of stripped coal in comparison with all coal mined in that year.

Table II—Tonnage of Bituminous Coal Produced by "Mechanized Mining" in 1929

	Net Tons	Per Cent
Loaded by machine:		
Mobile loading machines	16,613,000	85.1
Scraper loaders	1,549,000	7.9
Duckbills and other self-loading conveyors	a1,321,000	6.8
Total loaded by machine	19,483,000	100
Handled by conveyors:		
Duckbills and other self-loading conveyors	1,321,000	6.7
Pit-car loaders	14,786,000	75.1
Other hand-loaded conveyors	3,585,000	18.2
Total handled by conveyors	19,692,000	100
Recapitulation, less duplications:		
Mobile loading machines	16,613,000	43.9
Scrapers	1,549,000	4.1
Pit-car loaders	14,786,000	39.0
Conveyors, including Duckbills	4,906,000	13.0
Grand total, mechanized mining	37,854,000	100

a The figure for Duckbills probably will be increased by late returns.

Table III—Increase in Total Tonnage Mechanically Mined, 1928-1929

(Includes pit-car loaders and conveyors)

State	1928	1929	Increase Net Tons	Increase Per Cent
Illinois	6,971,000	17,752,000	10,781,000	154.6
Indiana	2,426,000	3,362,000	936,000	38.6
Pennsylvania	2,682,000	4,234,000	1,552,000	57.9
Wyoming	2,682,000	*3,002,000	320,000	11.9
Utah	878,000	1,333,000	455,000	51.8
Montana	367,000	778,000	341,000	92.9
Kentucky	598,000	805,000	207,000	34.6
West Virginia	2,190,000	2,698,000	508,000	23.2
Virginia	794,000	984,000	190,000	23.9
Alabama	614,000	934,000	320,000	52.1
Other States	1,357,000	2,042,000	685,000	50.5
	21,559,000	37,854,000	16,295,000	75.6

* This figure may be increased by late returns, as the State Mine Inspector of Wyoming reports 3,182,000 tons mined mechanically, excluding stripping.

Table IV—Comparative Increase in Tonnage Handled by the Principal Types of Machines, 1928 to 1929

Type of Machine	1928 Net Tons	1929 Net Tons	Increase Net Tons	Increase Per Cent
Mobile loading machines	11,811,000	16,613,000	+4,802,000	+40.7
Scraper loaders	1,548,000	1,549,000	+1,000	+ 0.1
Duckbills or other self-loading conveyors	1,200,000	1,321,000	+121,000	+10.1
Total loaded by machines	14,559,000	19,483,000	+4,924,000	+33.8
Pit-car loaders	4,117,000	14,786,000	+10,669,000	+259.1
Other hand-loader conveyors	2,883,000	3,585,000	+702,000	+24.3

tric Coal Cos. is expected to move a half million cubic yards per month.

Mr. Spencer discussed the troubles incident to the presence of clay slips or horsebacks in the Cherokee Seam in the Kansas field. These horsebacks constitute 13 per cent of the coal in place. It has been found preferable to remove this clay in advance of the loading unit by the use of a $\frac{3}{8}$-in. standard-type or a $\frac{3}{4}$-in. full-revolving shovel. The material is piled on the top of the coal and then pushed into the area from which the coal has been removed by a caterpillar tractor propelling a "maintainer blade." A power sweeper makes the job complete.

Whatever others may think, Mr. Spencer favors, for his conditions, standard-gage tracks for hauling coal to the tipple. After an experience with 42-in. gage, 15-ton drop-bottom, 8-wheeled cars, he tried standard-gage 35-ton, 8-wheeled, drop-bottom cars and found them preferable. An Indiana operator of experience, he said, advocated light equipment, so as to reduce track maintenance. Perhaps it might suit Indiana conditions better than it would those in the Pittsburg (Kan.) district, where his experience had been gained.

One plant in the Kansas-Missouri field, loading 1,500 to 2,000 tons daily, is using 12-ton motor trucks for the hauling of its coal and finds the experiment successful. Mr. Spencer declared that one of the biggest of shovels will remove dirt for 5 per cent less than an 8- to 12-ton shovel, but that difference looks inconsiderable to anyone who has to lay his shovel idle for any large portion of the year.

W. H. Rastall, chief, industrial machinery division, Bureau of Foreign and Domestic Commerce, gave credit to German Lower Silesia for the greatest degree of mechanization in the displacement of coal in Europe—namely, 76.3 per cent. Belgium comes next, with 73.8 per cent; the Ruhr, 65.3; Nord and Pas-de-Calais, France, 65; Scotland, 56; Northumberland, England, 55.7; German Upper Silesia, 54.1 per cent. But the progress is all very new as compared with that in the United States. In Northumberland, in 1913, only about 13.8 per cent of the coal produced was cut by machines. That year, Nord and Pas-de-Calais had 1,392 mechanical picks, whereas in 1927 it had already 18,320. In 1914, Germany mined only 0.5 per cent of its coal mechanically. Yet in 1926 the mechanically loaded tonnage had

Fred J. Maple

increased to 50.4 per cent. This change in Germany was due to the favor shown to pneumatic picks, which increased from 378 in 1918 to 71,332 in 1925. To these latter should be added 1,044 large coal cutters, 748 horn-type cutters, and 316 of another type not used in 1913.

Eugene McAuliffe, president, Union Pacific Coal Co., Omaha, Neb., said that in 1923 the company had a labor turnover of 125 per cent per annum. It decided to cease hiring men, thus eliminating floaters. In that year 3,241,000 tons was mined by 3,034 men, only 3.2 per cent of the coal being mechanically loaded. In 1929, the force had been reduced to 1,845 men, the mechanically loaded coal constituted 58 per cent of all the coal mined, and the tonnage was 3,060,000 for the year. The number of men had been reduced 39.2 per cent, yet the tonnage was almost the same. Invested capital in machinery was 21.7c. per ton of coal loaded during 1928; in 1929, it had dropped to 13.8c. per ton. As for the coal costs, they had been reduced 29.6 per cent. Actually it was more than that, because of a wage reduction, but the figures here given for cost of coal have been augmented to make the costs comparable.

Mr. Conner, commenting upon the statistics of mechanical loading, which covered only bituminous operations and represented 1,549,000 tons of coal as having been loaded by scrapers, said that one anthracite company alone undercut and loaded by scrapers about 2,000,000 tons yearly.

Mr. Spencer remarked that the German machines for removing stripping material had been developed to suit the light overburden above the German lignites. It might be that these conveyors could be changed so as to be better fitted for some, even if not all, of the American overburden materials. Then we could have continuous cutting. The materials thus cut could be delivered to a conveyor and dumped behind the working face.

What's New in Mechanical Loading?

TRACK-MACHINE cutting and face preparation, gathering, power, and graphic cost charts were the four subjects treated at the opening mechanized mining session May 6, presided over by R. L. Ireland, Jr., manager, bituminous mines, M. A. Hanna Co. Cleveland, Ohio. R. J. Oldham, superintendent Centralia (Ill.) Coal Co., in a paper on "Gathering Methods Developed for Mechanized Mining," told of the use of relay or swing locomotives between the parting and the loading machine tender or gathering locomotive. By this method car changes at the Joy machines average between 1 and $1\frac{3}{4}$ minutes and a uniform average monthly performance of 106 to 114 cars per machine shift is obtained.

The mine is a shaft operation in the Illinois No. 6 seam and was changed to machine loading in November, 1927. Wooden mine cars of 24-in. wheelbase and having a mechanical-loading capacity of 2.7 tons are being replaced gradually by steel cars of 34-in. wheelbase averaging 2.9 tons capacity. Tendency to derail if loading was not started first in the center of the car proved a serious objection to the short wheelbase of the original cars.

Room-and-pillar projections were changed to 45-deg. room necks and crosscuts. Tracks are installed in most of these room crosscuts to facilitate moving the loading machine and provide car storage space for the gathering locomotive, which is a 5- or 6-ton cable-reel unit. On panel entries and for the room switches off of them, 30-lb. rail is used. In rooms the track and switches are 25-lb. rail. In place of old-style switches curved turnouts having wing rail and

filler rail integral with the frog are being substituted.

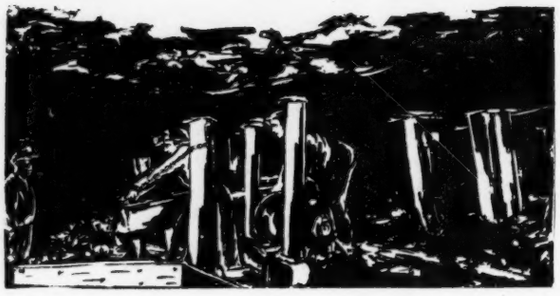
From the parting served by the main haulage, the relay locomotive brings twelve to fourteen empties and places them in a room adjoining the loading machine, or in a crosscut off the loading room if the latter is deep enough. Three or four at a time, these cars are taken by the gathering locomotive to the loading machine and the locomotive remains coupled during the loading. After the first loads have been placed in the crosscuts and the last empty is placed at the loading machine, the locomotive leaves to get another trip of three or four. Maximum travel distance of the gathering locomotive is limited to 250 ft. but rarely exceeds 125 ft. One relay locomotive serves two or three loading-machine gatherers and with its crew of two men pulls 275 to 325 cars in 8 hours.

In reply to a question, Mr. Oldham stated that two tracklayers are required for each loading machine. When three machines are served from one parting there are six tracklayers on the territory.

In a short discussion submitted by Charles Gottschalk, Big Vein Coal Co., Evansville, Ind., and read by G. B. Southward, mention was made of a track-mounted crane which has been used for about six months to speed car changing at his mine. Slides were projected showing how the crane lifts a car from one track and swings it to a parallel track, cutting car changes 30 seconds and increasing loading machine capacity 75 to 100 tons per day.

Carl Lee, electrical engineer, Peabody Coal Co., Chicago, said his company has experienced no particular trouble by derailment when using 24-in. wheelbase cars with loading machines. The performance under conditions quite similar to those reported by Mr. Oldham is something over 100 cars per shift, or approximately the same, but the Peabody mines do not drive as many of the crosscuts on 45 deg. Change to mechanical loading reduced the car capacity about 20 per cent, so side boards have been added.

In a paper on "Coal Cutting and Face Preparation With Track-Mounted Machines," prepared by George F. Campbell, general manager, Old Ben Coal Corporation, Chicago, and read in brief by Fred A. Heitzman, Cincinnati, Ohio, the displacement of shortwall machines by track-mounted cutters in southern Illinois was discussed. It was predicted, however, that shortwall machines would not disappear entirely from the field in 15 years, although the track-mounted cutter will do about twice the work. Both cutting-and-shearing and plain cutting machines, of the track-mounted type are used in the field. Undercutting is the universal practice. Shearing and cutting-and-shearing machines are used where seam conditions will give a larger percentage of lump if both shearing and undercutting are done.



Two ways of extending rigid tracks for heavy machines are general: (1) laying short pieces of rail of average undercut length, and, (2) using long slide rails on special steel ties. In some cases old rail of light section is used by taking up a strip of bottom just wide enough to admit the track.

Shooting of the arched or circular cuts made by track-mounted machines in the Old Ben mines presents a more difficult problem than was the shooting following shortwall cutters. Top holes are always drilled level and about 12 in. from the ceiling. Snubber holes are placed so that the explosive is just above the blue band. Four top holes are the common practice for both plain and sheared faces. For machine loading with either type of cutting, two or three snubber holes are used, instead of one or none for hand loading.

Chairman Ireland remarked that when 16-lb. rail was displaced by 30-lb. to accommodate Oldroyd cutting machines in Ohio mines of the Hanna company, it was found that the efficiency of the transportation system nearly doubled. As a result, 30-lb. rail has been made the standard for all rooms. Mr. Ireland stated that changing from shortwall cutting to Oldroyd cutting and shearing, reduced the powder consumption a small but undetermined amount and reduced the slack about 3 per cent.

T. F. Whalen, Pittsburgh & Erie Coal Co., Pittsburgh, Pa., who has used Oldroyd cutters for six or more years in the Pittsburgh seam, said that with properly laid track a well-trained operative has no trouble in keeping the cutter bar absolutely on the floor. He added that copper is "about the cheapest thing you can buy about a coal mine." There was no appreciable difference in the percentage of slack in the hand-loading mine with cutting only, and the machine-loading mine with cutting and shearing. In reply to a question by C. C. Hagenbuch, mining engineer, Consolidation Coal Co., Fairmont, W. Va., he stated that first cuts of crosscuts are not sheared but that skillful operatives can shear second cuts. As a rule, the third cut is the first one sheared.

"Power in Mechanical Mining," by Carl Lee, brought out the far-reaching power effects of the introduction of loading machines into a mine. Although, under average conditions, the actual power required by the loading machines probably does not exceed 0.5 to 0.7 kw.-hr. per ton, the addition of gathering locomotives for rapid car changing may increase the connected load of gathering locomotives by 50 per cent.

He exhibited a chart illustrating how the generating capacity in percentage of connected load drops as the connected load increases. This chart indicates that for a 1,000-hp. connected load 400 kw., or 40 per cent in generating capacity, is required, while for an 8,000-hp. load about 2,000 kw., or 25 per cent, is required. Considering the auxiliaries, introduction of mechanical loading may increase the total inside load as much as 50 per cent over hand loading. Due to this increase and the greater loss by delays and slowing of equipment if voltage is not kept up near motor ratings, it becomes more important to investigate the possibility of dividing the substation load into units placed close to the working sections.

A discussion prepared by F. L. Stone, General Electric Co., Schenectady, N. Y., pointed out that in a 4,000-ton mine the power waste per

day at 1c. per kilowatt-hour probably would amount to $32 at a 20 per cent transmission loss, or $16 with a 10 per cent loss. The other item of wasted time due to low voltage may amount to a tremendous figure. Consideration of substations near the load centers becomes of increasing importance with mechanical mining. Rapid extraction, which brings about a frequent shifting of load center, has brought development of portable mine substation equipment.

Attention was called to the lack of progress in setting standards of mine wiring in keeping with the increasing quantity of permissible and explosion-tested equipment being installed. In this regard M. D. Cooper, Hillman Coal & Coke Co., Pittsburgh, Pa., said that the Engineers' Society of Western Pennsylvania has proposed a set of unofficial electrical or mine wiring standards along lines favored by the U. S. Bureau of Mines.

Detailing a practice started by the Hillman Coal & Coke Co., six years ago, W. L. Affelder, vice-president, Pittsburgh, Pa., explained the importance of graphic cost charts in mechanized mining. He exhibited three charts on conveyor mining. The graphs are extended from figures compiled for semi-monthly periods and become available to the operating officials about seven days after the close of the half month and about two days after the railroad weights are available. Chart No. 1 included graphs of total conveyor tonnage, feet of entry driven, labor cost, combined labor and supply cost, and loading labor. Chart No. 2 showed tonnage, and costs of yardage, deadwork, moving conveyors, repairing, superintendence, explosives and supplies. No. 3 showed total labor and supply cost, tonnage, and feet of entry driven, separately for each of six conveyors. The speaker emphasized the importance of having graphs of the components of the cost to indicate the specific item or items responsible for wide variations.

Bringing the charts down to date requires the time of one clerk for less than a day each half month. No extra burden is placed on the accounting department for obtaining data for the charts. The information would be compiled even if the charts were not plotted. The point is that the data are available, so they should by all means be put into a form which is the most useful and comprehensive for the operating officials.

Answering questions regarding the conveyor work, Mr. Affelder said the working height is 3½ to 5 ft., the top fairly good, and rooms are driven 35 ft. wide with 25-ft. pillars between. Costs show no consistent change when the conveyors are employed on pillars.

Mechanization Gains in Thin Seams

THE SECOND SESSION on mechanized mining, presided over by D. D. Dodge, general superintendent, W. J. Rainey Inc., Uniontown, Pa., was held on the afternoon of May 7 and opened with a paper by John H. Richards, chief mining engineer, Wheeling & Lake Erie Coal Mining Co., St. Clairsville, Ohio, on "Entry Development With Conveyors." This subject was treated in the preceding issue of *Coal Age* (Vol. 35, p. 227). Mr. Richards said that the introduction of Duckbill conveyors had at last given his company control over entry development, which, in the past, had too often held back production.

G. A. Brown, superintendent Union Pacific Coal Co., Rock Springs, Wyo., asked how crosscuts were driven between entries at this mine. Mr. Richards explained that one cut was driven in and loaded by the Duckbill, and that with each new set-up two crosscuts were driven and loaded out by hand, with the exception of the first cut, as noted. Mr. Brown said that at the Union Pacific mines, by the aid of two swivels, the entire crosscut, even though at right angles to the headings, could be loaded out with the aid of Duckbills. If the crosscut was driven as a slant between the two headings, one swivel would suffice.

By driving rooms ahead with double-chain conveyors at the Kimmelton mine in Somerset County, Pennsylvania, the Reading Iron Co. has reduced pillars for a 40-ft. room to a mere 6 ft., yet drives the room for a distance of 300 ft., according to George J. Krebs, general mine superintendent of the company. The roof of this seam is good, consisting of hard sandstone 20 ft. to 30 ft. thick, with 120 to 150 ft. of sandrock and slate as overburden. The floor, too, is strong, the stratum immediately under the coal being slate and bony coal, 5 to 10 in. thick, with a limestone underpinning 6 ft. thick. The fact that the roof and floor are so good and the cover so light, explains partly why the trick can be turned, but the essence of the success is in speed.

In earlier days, with hand loading into cars, the pillars were made 16 ft. wide and the rooms only 24 ft. wide, a ratio of pillar width to room width of 1 to 1.5 instead of, as at present, 1 to 6.66. But in the hand-loading rooms the bottom had to be lifted and that weakened the pillar, slowed the progress and made more pillar area necessary.

When conveyor work was started, with men paid by the day, the coal loaded by five men—four at the face and one at the mine car—totaled only 40 tons per shift. Progress was accordingly slow, and the ribs could not be removed, though the pillars were 20 ft. wide and the rooms 40 ft. wide, which is a ratio of pillar width to room width of 1 to 2.

With the present arrangement, the 6-ft. pillars are lost and the prop rows, with props at 4-ft. centers, are not removed. Each room has a Lorain main and a Lorain cross conveyor, with the latter set parallel to the face and 18 in. from it, delivering into the main conveyor. The men undercut the coal in 35 minutes; drill and shoot it in 15 minutes; lengthen the conveyor in 20 minutes and load coal in 80 minutes. Thus the entire cycle takes about 2½ hours. An average number of cycles, for an 8-hour shift, is 2½ to 3, but four cycles have been completed in that length of time.

Each cycle removes 6 ft. of coal, so the progress is from 15 to 18, or even 24 ft. per 8-hour day, which is walking into the coal at a lively gait. It is said that 85 per cent of the coal is recovered. A narrow neck 14 ft. wide, is left at the room mouth, and the room becomes full width by the time it has progressed 24 ft. Coppus Vano blowers and Ventube pipes are

used for ventilation and power drills are provided for sinking the shot-holes. A Brownie hoist lifts the coal into the cars.

Only one room is being driven out of each heading of a butt entry at any one time. The rooms on adjacent butt entries are driven to meet at a point 300 ft. from each heading, for the adjacent entries are driven 600 ft. apart in the clear. The butt-entry pillars and the stumps of the butt entry are ultimately removed, but this recovery work is caused to lag behind the room work 200 ft., so that it is possible to place 15 to 18 cars behind the neck of the room being driven and to advance these cars one by one under the "hoist" or loading boom at the end of the conveyor. The thickness of the coal runs from 24 to 36 in. and the seam is free from impurities, binders, rock rolls and faults. All three of the units are producing, on an average, 70 tons per shift, the maximum having been 121 tons, and in the 24-in. coal, 117 tons. The butt entries between adjacent main entries are 1,500 ft. long.

The room having been finished, the power end of the face conveyor is 300 ft. away from the heading in extremely low coal and with no natural means of self-locomotion. Ingeniously, the power end of the face conveyor is loaded on the cutter bar of the cutting machine, the facilities of which include, of course, a means of locomotion. In 30 to 45 minutes the cutting machine has pulled itself and its rider out to the entry, the former being ready to be slid down onto the track and the face conveyor pushed along a berm left for that purpose along the side of the track.

Here it should be noted that the true roadway of the heading is only 12 ft. wide, but the heading as a whole is driven like a gob heading 18 ft. wide, though no rock is gobbed. The 6-ft. berm is left as free ground for the maneuvering of the conveyors. The entire outfit is removed from one room to the next in an 8-hour shift and 20 to 30 tons is loaded from the new place within that same day.

In driving entries, only the main conveyor is used for the handling of coal. Sometimes that necessitates double shoveling. Three men work at the face and one trims the cars, which are taken by a rounding crosscut from one heading to the next, much as in the Wheeling & Lake Erie Coal Mining Co.'s mine, the cars being loaded as they round the curve past the conveyor. After the heading has been driven 250 ft. the conveyor is shifted on to the berm along the room side of the heading and the bottom is blown up. Thus the conveyor is set too high for the loading of the rock. Consequently, the cars are loaded direct. A crew of three men in 42⅔ shifts advanced the rock work of headings 884 ft., or 20.7 ft. per shift, which is equivalent to 6.9 ft. per man-shift. If the No. 3 mine were entirely mechanized, said Mr. Krebs, it would produce 550 to 600 tons per shift from seven working places, and this could be done, because each room worked by conveyors would produce as much as five rooms would yield when coal was loaded by hand into mine cars.

In discussing the work with conveyors at his mines, L. H. Schnerr, Consolidation Coal Co., Somerset, Pa., said that the "E" seam he was working had 8 in. of bone with slate above the bone. Above that was 34 in. of marketable coal. The cuttings were made in the bone and these were thrown into the gob. The best record was 88 tons loaded from a room in a single shift. In his opinion, the triple shift did not pay, for one shift was needed for repairs. With three shifts, the repairs were left by one shift to the next; as a result, they were not made.

Eugene McAuliffe, president, Union Pacific Coal Co., Omaha, Neb., declared that miners should not work solely for a day labor compensation; men needed some incentive to induce them to use their best endeavors. He had a union contract rate, but had thought it advisable to add a bonus to that rate as a reward for increased efficiency. Some men had accepted the bonus, but others demurred. The premium paid, perhaps, should be made larger than that which he had offered, as the incentive to do good work was still inadequate to produce the desired results.

Earl H. McAlpin, mining engineer, Hailey-Ola Coal Co., Haileyville, Okla., briefed a paper on "Long-Face and Longwall Mining." At the Kali-Inla mine, of the Kali-Inla Coal Co., near Hartshorne, Okla., a cut 300 ft. long is made the full length of the long face, and as the unsupported roof in front of the face and over the undermined coal is 9 ft. wide, no less than 2,700 ft. of roof is left unsecured by posts or jacks.

This does not always work as well as is desired. The drawslate comes down and cannot be loaded out concurrently and into the same conveyor with the coal, and as there is only one conveyor, coal loading therefore must cease until the slate has been loaded into cars. For this reason, when a new cut has to be made across the face, the coal is now undercut for only a distance of 25 or 30 ft. It is then shot down and loaded onto the conveyor from the side. As soon as that is done, the conveyor is moved over; then the place is cut another 4 or 5 ft. and the coal is again loaded, this time onto the end of the conveyor. Thus only about 50 sq.ft. of roof is unsupported at any one time, and the drawslate can be kept in place, but, if that cannot be done, the small quantity that desires to fall can be loaded out before advancing further along the coal face. In this manner, the face can be skipped under bad top as much as 60 to 65 ft. per shift by a crew of eight men.

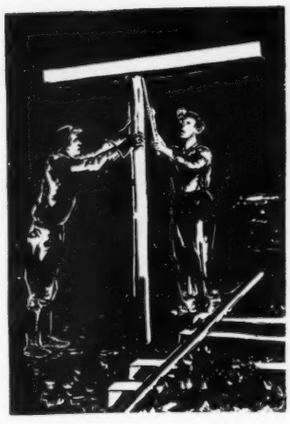
Mr. McAlpin also described the long-face system of the Milby-Dow Coal Co. at Dow, Okla. This is a 300-ft. face protected by rows of light cribs, built of split timber, and placed at 15-ft. centers. These cribs allow the weight to come down on the face, which, however, needs to be shot. The cover is about 600 ft. thick. Usually the roof does not bend near the face enough to crush the second line of cribs. Sometimes it does, however, and then experience shows that the safety of the face is threatened. The men may be driven out and the conveyor and the cutting machine covered by fallen rock. When, therefore, the second line of cribs begins to fail under the load, a row of 4-ft. blocks, 6x8 in. in cross-section and set parallel with the face, is erected solidly on the outby of the conveyor. This has always been found effectual in protecting the face.

Three men cut the full length of the wall in 3 hours; three men then drill the face; and four men simultane-

ously with the latter three move over the conveyor so that one edge of it is within 6 in. of the undercut. They also place a pit-car loader at the end of the conveyor. A shotfirer then shoots the entire wall. Everything is then ready for the day shift of seven loaders, two drivers and a trimmer, who proceed to load out the coal. Each loader takes 40 ft. of face, for the coal is only 2 ft. 10 in. thick. Three sets of cribs along the roadway take care of the support of the entry roof. It may be added that the entries are driven 55 ft. wide and provide two haulageways on 38-ft. centers, which are brushed to a height of 7 ft. The rock is gobbed solidly between these haulageways. The long face goes directly up the pitch, which varies in steepness from 7 to 11 deg. The production per man-shift at the face is about 6½ tons.

At the Hailey-Ola mine, the long faces lie straight up the pitch, as in the other two instances, but here the pitch is heavy—26 deg.—whereas in the other two instances it is relatively light; the coal also is thicker—namely, 5 ft. The support sought from the cribbing is more rigid than in the Milby-Dow mine and less rigid than the support afforded by the jacks in the Kali-Inla mine. The cover where the work is being done is 800 ft. thick, and the rock does not break readily, possibly because of the thickness of the cover. The roof is aided in breaking by shots in a row of 8-ft. drillholes. When it begins to break, of its own volition, the breaks are hard to control. The roof is supported at the face by timbers at 3-ft. centers on the strike of the seam and at 4-ft. centers on the pitch, but at almost every 60- to 72-ft. advance lines of cribs are placed to assist in roof subsidence. As the entries are located at 180-ft. centers, the wall is only 150 ft. long. The coal along the working face is removed by bars without shooting, beginning at the entry and working upward toward the upper end of the long face. The coal slides down on the bottom, which is prepared to receive it by laying on it 4x8-ft. x 14-gage galvanized sheets, nailed with 20-penny nails to the 3 to 4 in. of bottom coal which is left in undercutting, but is lifted and slid down to the car as the sheets are torn up. Machine cuttings are gobbed.

Another system, which Mr. McAlpin described, is that of the Mullens Coal Co., at McAlester, Okla. Here the face is along the strike and not up the pitch, which is



inclined at an angle to the horizontal of 20 deg. The cutting machine in consequence has to be held in place by a 16-lb. rail, which is backed by 2x10-in. boards which are themselves backed up by a line of props; otherwise, the machine would slide down the dip. In this mine two headings comprising an entry are separated by a coal pillar 20 ft. thick with crosscuts at 25-ft. centers. It is as an extension of these crosscuts that the chuteways are driven up, four of these chuteways being driven at one time, the face being cut in a straight line 100 ft. long at right angles to the chuteways.

Chocks protect the chutes on either side. The chutes have a maximum run of 100 ft., the entries being at 160-ft. centers. The rest of the space between entries is occupied by two 20-ft. pillars and by the width of two headings, which aggregates another 20 ft. Unfortunately, it often happens that, owing to the threatened collapse of the roof, the long face cannot be advanced the full 100 ft. In that case it is abandoned, though an effort is first made to drive a narrow airway up to the entry above.

Galvanized metal is laid in the chutes to aid the coal in sliding. Except in the corners, no shots are needed, and even there a light shot suffices. It is thought that the coal on either side of all haulageways should be removed so as to get a complete break. That can be done by starting at the property line and working on retreat. It has been proposed that this method be adopted at this mine as a means of getting 100-per cent recovery.

C. A. Griffith, Pruden Coal & Coke Co., Knoxville, Tenn., described the use of the Cosco Duckbills and conveyors at his mines. He tried at first to use sand jacks but found it better to use the Lorain jack, because it could be more readily collapsed. The roof breaks with great regularity, and the men have entire confidence in the ability of the jacks to prevent the extension of breaks to the coal face.

Mechanical Loading in High Coal

MECHANIZED MINING in high coal was the theme of the third session of this part of the program held on the morning of May 8, with W. J. Jenkins, vice-president and general manager, Consolidated Coal Co. of St. Louis, presiding. Two of the four papers delivered dealt with mechanization in railroad fuel mines, both of these in high coal, one located in Illinois and the other in West Virginia; a third described experiments in Colorado with three unusual types of conveyors, and the fourth covered progress in mechanical loading for rock work and reopening silted and caved areas in the anthracite field.

T. J. Thomas, president, Valier (Ill.) Coal Co., stated that the Valier mine, in southern Illinois, had been opened as a railroad protection measure resulting from the World War and represented an investment of approximately $5,300,000 in coal lands and physical plant. Because of high production cost, the company was confronted with making a decision between shutting down the mine, which would necessitate the parent company—the Burlington railroad—absorbing the carrying charges, and spending money for mechanization. The latter course was selected, and in 1926 a policy was adopted that no work should be done manually that could be done mechanically, within the limits, of course, of the economic and human factors.

Topworks was mechanized first and then the mining. These top improvements included tractors with lifting attachments, revolving crane mounted on a heavy-duty truck and equipped with lifting magnet for handling rail and scrap and clamshell lifter for handling timber, monorails for material handling, gasoline locomotives, gravity conveyors for material such as cement blocks, and certain automatic devices such as electric water heater with thermostatic control.

Along with mechanization of load-

ing, ventilation was improved by cleaning and center-propping airways, and the effectiveness of rock-dusting was increased by installation of a piping system for spraying machine cuttings. Even the track cleaning was changed to mechanical by using the Bottomley attachment on the gathering head of a coal-loading machine. With this device three men clean 1 mile of main and cross entry in 8 hours. Carbon-dioxide shooting was adopted for speeding development. A 500-kw. automatic substation was installed and the mine equipped with portable transformer substations.

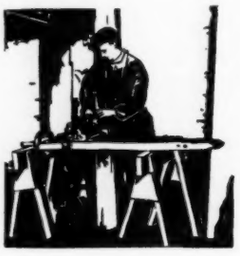
Self-propelling pit-car loaders were tried for track cleaning, but were found unsatisfactory because strenuous human labor was not eliminated. The top mechanization cost $23,870, and the bottom mechanization, including substations, cost $175,000 to $200,000, bringing the total in the range of $215,000 to $225,000. Joy loading machines are used. The carbon-dioxide method increased the cost of shooting but its use is now considered almost indispensable for entry driving. It is not used in rooms.

A paper by Herbert B. Husband, general manager of fuel mine operations, Chesapeake & Ohio Railway, outlined the progress during the four years that mechanical loading has been practiced in C. & O. mines in southern West Virginia. Nearly 9 miles of entry has been driven mechanically and close to 300,000 tons of coal has been loaded. Three loaders, described as shovel-type, track-mounted, are now being operated double shift in the Eunice No. 2 mine, opened January, 1929, in the No. 5 Block seam.

The loaders have been used in beds ranging from 7 to 12 ft. in thickness and having thin to extremely thick partings and with bad to ideal roofs. Each year the mechanical production has been increased and its cost reduced. Photographs of the machines in operation and production and maintenance data appeared in *Coal Age* last year (Vol. 34, p. 675).

F. W. Whiteside, chief engineer, Victor-American Fuel Co., Denver, Colo., described experiments with three types of conveyors in Colorado mines of the company. Practically all working places in many of the mines of the state require timbering within 3 to 4 ft. of the face, which condition has limited mechanical operation to conveyor equipment. The first effort was with a conveyor mounted above the center of the track and supported by sectional trusses on each side and 5 ft. 10½ in. high. Coal is hand loaded onto the "bull-nose" end of the conveyor, which is moved forward by a winch so that the nose is pushed a distance under the loose coal. Five or six coupled cars are run under the conveyor and the trip is moved out a car length each time for spotting during loading. The conveyor was built by the company in 1926 at a cost of $2,375 and is still in use.

The second type built followed the same idea of loading several cars without uncoupling, but in seams of coal so thin that the conveyor has to be placed alongside instead of above the cars. On this machine the nose can be swung to either side so as to reach the corners of 20-ft. rooms.



The conveyor proper is 45 ft. long and is supported on sectional frames to facilitate moving after the place is driven up. The drag is a single chain with flights, and at the end the coal is turned and discharged over the side of the car. In the return run the flights shift to a vertical position and the chain is to one side and below the upper run. Twelve of these conveyors have been built at a cost of $2,200 each.

The latest effort is a shaking conveyor conceived in its original form by G. D. Jones, a superintendent with the company. The 6-ft. pans are hung from cross timbers and each is fastened to a drive rope that operates underneath. The arrangement includes a tail rope from the differential-motion-drive engine, so as to force a positive motion in both directions. Conveyors are operated at right angles to the main, but from the same drive. The motor horsepower has been increased to the point that one machine is now driving 2,300 ft. of pan conveyor on grades of 2 to 4 per cent in favor of the load. Further details on the operation of the Jones conveyors will be found in earlier issues of *Coal Age* (Vol. 33, p. 156; Vol. 34, pp. 206, 208).

Discussing operation in general with conveyors, Mr. Brown said that it is now possible to purchase conveyors which will stand the work, but that all of the first conveyors purchased by the Union Pacific company had to be rebuilt. Continuing to refer to the same company and to shaking conveyors, he said that for the last two years conveyor mining has been reduced to a standard. As an indication of the bad roof conditions under which some of the conveyors are operated, he stated that timbering cost, material and labor added, runs as high as 25c. per ton. Under bad roof conditions, in 1929, at one operation the tonnage per man was 12.5 to 13, all inside mine labor counted.

The average for a six months period in the Winton mines of the Union Pacific was 13.3 tons per man shift and the labor cost 58.6c. per ton. At another operation the tonnage was 13.25 and the cost 59.4c. Labor costs runs from 55 to 67c. and material costs are in the range of 5 to 16c. Conveyor moving cost runs about 2½c. per ton and conveyor maintenance about the same figure.

Answering a question by Mr. Brown, Mr. Whiteside said that with the Jones shaking conveyor the rope breakage has been troublesome only at the bell cranks and that this has been practically overcome by a new flexible hitching. In reply to a question by Thomas Foster, Union Pacific Coal Co., Winton, Wyo., Mr. Whiteside said that Duckbills have not been tried on this type of shaking conveyor. A third question, this from Lyman Fearn, State Mine Inspector, Rock Springs, Wyo., was answered to the effect that, because of the Colorado law, shooting with powder cannot be done during the shift.

Sheldon Jones, efficiency engineer, Lehigh Valley Coal Co., Wilkes-Barre, Pa., in a paper on "Mechanical Loading in Anthracite Mining for Rock Work and Reopening Silted and Caved Areas," said that the most progress has been made in tunnel driving and that now many such projects are on 100 per cent mechanical loading. Because much of the unmined anthracite is in thin veins and most of the remaining pillar coal is in areas that were silted with ashes and breaker refuse, handling of rock and refuse assumes greater importance. Principally because of labor resistance, most of the rock is still loaded by hand, although good loading machines are available.

In a mine in the Red Ash vein the Lehigh Valley company has shown a marked saving by using a Myers-Whaley loader to drive a new road through pillars and across silt-filled

breasts. A specific example was the driving of 450 ft. in 35 eight-hour days at a labor cost of $650, or $4.33 per linear yard. In this distance the roof conditions were good. It was estimated that with hand loading the time would have been 115 shifts, and the cost $1,375, or $9.10 per linear yard.

In a Lehigh Valley mine at Hazleton a pit-car loader was put into use recently to load into cars 4 ft. 7 in. high in the driving of a rock gangway. It is for drainage, and speed is essential. With hand loading the progress was one 6-ft. cut in 24 hours. With the pit-car loader the expectation is two 6-ft. cuts, or possibly three in 24 hours. Pit-car loaders also are being used for gangway loading in Chauncey mine of the George F. Lee Coal Co., Avondale, Pa. The vein is 26 to 30 in. in thick-

ness and on the roads 4 to 6 ft. of bottom rock is taken. Use of the pit-car loader resulted in a 33 per cent reduction in yardage cost and an increased speed of 50 per cent. Another development is the use of the Sullivan mucker hoist for tunnel rock loading. A description of this installation and further data on mechanized tunnel-driving appeared in the preceding issue of *Coal Age* (Vol. 35, p. 207).

Where 100% Mechanization Rules

COMPLETELY mechanized operations featured the closing session of the convention, under the chairmanship of C. W. Gibbs, general manager, Harwick (Pa.) Coal & Coke Co. F. S. Pfahler, vice-president and general manager, Superior Coal Co., Gillespie, Ill., opened the meeting with a brief abstract of a paper prepared by himself and D. D. Wilcox, general superintendent, on "A 100 Per Cent Pit-Car Loader Operation." The Superior company, a subsidiary of the Chicago & Northwestern Railway, operates four mines in Macoupin County, Illinois, and has a 22,000-ton maximum daily capacity. For some time two of the mines have been fully equipped with pit-car loaders, and just recently a third mine was put on the same basis.

During 1929 the two mines which were on a 100 per cent pit-car basis loaded 1,786,797 tons with these machines. Costs were lowered and the accident record bettered. In changing to pit-car loaders no men were laid off but some had to go on turns. It was found that certain older men who before could not load coal could go back to that because the work is made about 50 per cent easier. In a unit consisting of 52 men, 32 or 36 of these load coal onto the 16 or 18 conveyors which are used by the unit.

Installation of the loaders made it necessary to entirely revise the mine-wiring and power-supply equipment and likewise to revise the inside management. Since all men are now on day wage, the accounting is by the life check numbers. A timekeeper at the bottom keeps the checks under lock and key while the men are working. Further data on the pit-car loader operations of this company were published last year in *Coal Age* (Vol. 34, p. 267).

J. S. McKeever, Kanawha & Hocking Coal Co., Longacre, W. Va., who said that his company had installed a number of pit-car loaders during the past year, called attention to the fact that the operating department has three selling jobs on mechanization. First, the idea must be sold to the parties controlling the finances, and he cautioned that the estimates of savings submitted to these individuals should be conservative. Next, it is necessary to sell the local mine management, and if they cannot be sold it is best to make a change. Finally, it is necessary to sell the worker, showing him that he can earn more money with the same labor or the same money with less labor.

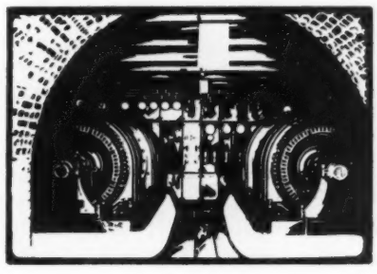
Mr. McKeever has found that it is best to use three men per machine regardless of whether it be on pillar, room, or entry work. He thinks it takes one to three years for an organization to learn to use new loading equipment efficiently. Frequent inspection of equipment by the maintenance man is essential to success.

C. R. Stahl, division superintendent, C. C. B. Smokeless Coal Co., Mt. Hope, W. Va., outlined briefly the salient points regarding the long-face scraper operations of his company. The coal is 30 to 48 in. thick, has local pitches as high as 12 per cent, and has good top and hard bottom. Two scrapers work on adjacent 150-ft. angle faces in the same panel. The faces load onto parallel entries separated by 30-ft. chain pillars which are not recovered. The faces are angled 45 deg. with these entries, so that at the upper end a point of solid coal tends to protect most of the face from the falls which usually occur on a line 90 deg. to the entry.

At times, however, 40 to 50 ft. of the end may be lost. Under such circumstances, the wall is lengthened as rapidly as possible to the original dimension. One face is kept 150 ft. in advance of the other, so that breaks on the two walls will not complicate each other. The hoist is a 35-hp. double-drum unit, and the scoop capacity is 1,500 lb. Eight men, including both shifts, make up the crew for one scraper unit. Loading is done at night, and cutting and timbering are done during the day. Both faces of a panel are cut with the same machine. The two scraper units loaded 76,076 tons during 1929. The production was 12.3 tons per man, including all men employed in mining and delivering the coal to the shaft bottom.

Replying to a number of questions, Mr. Stahl stated that a way has been found to drive entries with the scrapers, and when so done crosscuts are made only every 240 ft. Some gas is encountered in the entries and ventilation is by auxiliary blowers and tubing. A thick sandstone overlies the coal and falls come only once a week, or so. Because of the grades, only six cars make up a trip. The loading entry stays open far enough back to accommodate these cars at the loading station.

Plates are used across the top between cars to minimize spillage when moving the trip ahead. The coal very often sets down following the under-



cutting, which is done with an 8-ft. cutter bar. Shotholes are drilled 8 ft. apart and loaded with 2 to 2½ sticks of slow permissible. These holes are shot one at a time. The cover is 450 to 475 ft. Cribs are not used and no props are recovered.

The final number on the program was a second showing of the Wildwood film.

Bigger Transportation Units Favored

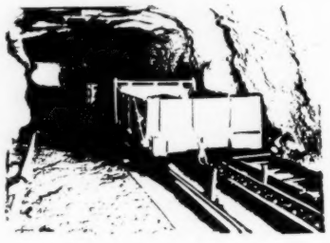
TRANSPORTATION always was an important factor in mining, but it assumes a still more important place with the advent of larger productions per mine and per unit area, said F. R. Lyon, vice-president, Consolidation Coal Co., Fairmont, W. Va., in opening the session on transportation and maintenance, May 6. Four papers were presented at the session: two were confined to transportation problems, another included with transportation the general practices in anthracite stripping, and the fourth was a lecture "movie" of Wildwood.

G. G. Kanable, chief electrical engineer, Rochester & Pittsburgh Coal Co., Indiana, Pa., outlined the changing conditions which for economy demand an investment in larger locomotives for long hauls at mines of 3,000 tons or more capacity. He defined a long inside haul in general terms as a haul which has become cumbersome and inefficient. Introduction of heavier locomotives is but a start in solving the problem. There immediately arises the effects on track, electrical distribution, mine cars, generating capacity, load factor, and demand.

Data supplied to Mr. Kanable by one manufacturer and said to be representative show that the horsepower per ton of gathering locomotives has been increased successively from a range of 6.66 to 7 on through a range of 9.25 to 9.6 and now stands at 10 as the latest practice. Corresponding figures for haulage locomotives are 6.46 to 8.4, 10.3 to 13.5, and 12.5 to 17.3. In both cases the first range represents equipment now obsolete.

In a short discussion read by Mr. Lyon, Charles M. Means, consulting engineer, Pittsburgh, Pa., called attention to the limits of the present type of electrical construction. Two 30-ton, 250-volt locomotives in tandem would require from 3,000 to 4,500 amp., he said. Multiple contacts to trolley wires, two or more wires, or a third rail system were suggested as possible solutions.

Answering a question put by C. E. Watts, Berwind-White Coal Mining Co., Windber, Pa., Mr. Kanable said his company is not using rolled-steel wheels but instead uses steel tires and from them gets two wears—that is,



they are turned in a lathe once during the life. Ball bearings have been applied to armatures of old locomotives in every case where design permits. There is a tendency to over-lubricate the ball bearings. Once every two weeks should be sufficient.

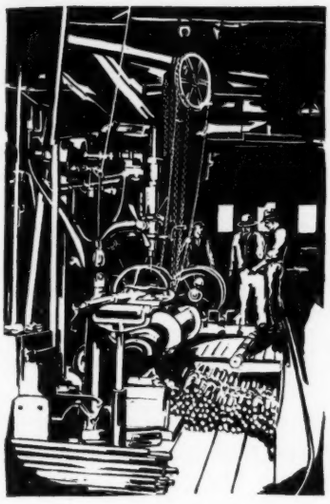
The chairman called on B. F. McCrackin, engineer of maintenance, Consolidation Coal Co., Fairmont, W. Va., for his experience with rolled-steel wheels and with certain new large locomotives. The company uses quite a number of the rolled-steel wheels, explained Mr. McCrackin. If proper salvage value is credited to the wheels, the sizes above 26-in. will deliver about 20 per cent more service. These are purchased with diameters 1 in. greater than standard for the locomotive, in order to allow for one additional turning.

Buying wheels with thicker than standard treads and applying these wheels to smaller locomotives after being worn to the limiting road clearance of the first locomotive was found to be without economy. The thicker treads cost more, because they are not standard and require special equipment for the manufacture. Bushing the wheels to fit the lesser diameter axles of the smaller locomotives is an undesirable necessity of the plan.

Based on experience with the introduction of heavy locomotives at the Consolidation mines, Mr. McCrackin believes that they are fully justified. He gave a brief description of the new 20-ton 11½-mile-per-hour locomotives which company officials believe are ahead of present practice. Each locomotive is equipped with two 150-hp. motors. Bearings are anti-friction throughout. Clearance under gear cases is over 4 in., so as to allow a full 3 in. of wheel wear. After the locomotives had been in service for a time, blowers were added to the motors to keep the roller bearings cool enough to hold grease. The motor heating was not sufficient to cause trouble in the windings. Mr. McCrackin believes that, with proper lubrication, 8 to 10 years of service should be obtained from a set of anti-friction armature bearings.

Actual operating and cost data showing the advantage of substituting larger mine cars were included in a paper on "Increasing the Capacity of Mine Cars," by F. S. Follansbee, chief engineer, Koppers Coal Co., Pittsburgh, Pa. At the mine where the change was made the haulage cost was reduced 3.3c. per ton and the total cost 15c. per ton. During 1928, and while operating with the old cars, the average daily dumping was 575 cars, each averaging 3.24 tons and making a daily production of 1,863 tons. During the last part of December the old dump and cars were replaced by a rotary dump and new cars that average 3.89 tons, or 20 per cent greater capacity. With nearly the same number of working days during 1929 and the same number of cars dumped per day, the average daily production was 2,236 tons. The new cars cost $121,000 and the saving during the year was $103,000.

That capacity is the first consideration in selecting new mine cars was emphasized more than once in the paper. The Koppers company now



has some cars which are but 25 in. above the rail and that have a level capacity of 128 cu.ft. These cars are 14 ft. long, 7 ft. wide, and may be used in 38-in. coal.

Mr. Follansbee thinks the future may bring cars 20 ft. long mounted on two sets of trucks. Such a car will require no greater entry clearances than one 12 ft. long and mounted on one set of trucks. He said that, with cars designed for rotary dumps and containing pockets where wet coal may stick, it may pay to keep a man to clean cars. At a 1,000-ton mine dumping 400 cars of 2.5 tons each, the extra man will pay if he adds but 0.7 cu.ft. to the capacity of each car. Mr. Follansbee said that one manufacturer has developed a car with rail brake.

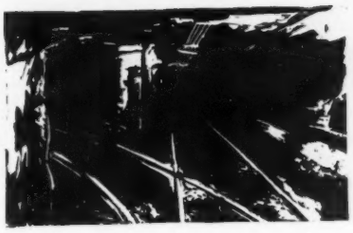
Eli T. Conner, consulting engineer, Scranton, Pa., said that size of mine car should be the first study in opening a property. Chairman Lyon stated that experience at mines of the Consolidation Coal Co. amply justified the cost of the new cars of larger capacity. He credited larger cars with an increase of nearly 3 tons per man at one mine.

Anthracite stripping and transportation were reviewed by W. S. Rausch, mining engineer, Lehigh Navigation Coal Co., Lansford, Pa. More than 2,000,000 tons of anthracite is stripped yearly; 3 or 4 to 1 represents the economical ratio of overburden removed per ton of coal, but the ratio has been increased somewhat by the modern equipment of recent years.

Electric dragline excavators and electric shovels are both used in the region. At the Lehigh Navigation Mammoth Vein stripping, a model 175-B dragline with 3½-yd. bucket has removed coal 125 ft. below the level of the machine. Standard-gage track with 80-lb. rail has been adopted wherever practicable. Locomotives up to 50 or 60 tons, pulling trips of three to four 30-yd. side-dump cars, are used. In one case the haul is two miles on an ascending grade of 2.6 per cent.

In inaccessible territory, where grades are excessive and when the total yardage of overburden to be moved is small, narrow gage continues in favor. Tracks of 36-in. gage are the common standard. With this type of haulage, the shovel capacity is restricted to the type using a 2½-yd. dipper. It was stated that 4 per cent should be the limit of grade, but that operation can be carried on with 6-per cent grades.

Wire drilling cable is now the standard for all new drills being purchased by the Lehigh company. The saving is 2½c. per foot of shothole drilled, as compared with the use of hemp cables. The drills are 6-in. and are operated 24 hours per day and 7 days per week.



Answering a question put by Mr. Lyon, Mr. Rausch said that the maximum depth of overburden removed is 200 ft., but that this is over the basin of a vein which was hit at 25 to 30 ft.

A feature of the afternoon's program was the showing of a moving picture of Wildwood, made by the Westinghouse Electric & Manufacturing Co. W. P. Vance, chief engineer and general superintendent of the Butler Consolidated Coal Co., explained the operations as the picture was shown. The Wildwood mine is covered in detail on pp. 267-290 in this issue of *Coal Age*.

Coal Cleaning Has Its Innings

NO LONGER can a tipple employee be assigned the job of coal inspector and be required to watch the preparation of coal in addition to performing other and varied duties. Today, with the coal buyer ready to change the source of his purchases, an adequate and intelligent inspection department must be formed which will be wholly independent of the operating department, with which, however, of course, it should work harmoniously. This was the judgment of W. E. Tissue, assistant manager of sales, White Oak Coal Co., Macdonald, W. Va., who described the plant installed by the Pittsburgh Coal Washer Co. at the Oakwood mine of the New River Coal Co., at the cleaning session, held May 8, with R. E. Taggart, vice-president, Stonega Coke & Coal Co., Philadelphia, Pa., as chairman.

The Oakwood plant has a capacity of 120 tons hourly and cleans all the coal between 2½ in. and ½ in. The lower size, not having more than 5 per cent ash and not exceeding 0.5 per cent sulphur, does not need cleaning. The tipple has a set of rolls to break up the lump coal to egg and smaller when lump coal is not in demand on the market.

Wonderful results in the cleaning of strip-pit coal were described in a paper read by William H. Stewart, general superintendent, Central Indiana Coal Co., Linton, Ind., who said that analyses showed 16 to 24 per cent of ash in the 1¾-in. unwashed screenings. After washing this coal in a Simon-Carves washer, the percentage of ash is reduced to 8.34. This plant and its operation were described in *Coal Age* last year (Vol. 34, p. 220).

A dry-cleaning plant at Acosta, Pa., near Somerset, Pa., was described by R. E. Rightmire, engineer of tests, Consolidation Coal Co., Fairmont, W. Va. This plant cleans the minus 2½-in. Jenner coal from the "C. Prime," or Upper Kittanning, coal bed. It is of Peale-Davis construction and consists of a primary table of 300 tons hourly capacity with a bin of 150-ton capacity, a re-treatment table of 100 tons hourly upward with a 75-ton bin, a dust chamber, conveyor and elevators to handle the raw coal, cleaned coal, and refuse coal, and two crushers to break the coal free from impurities.

Paul Sterling, mechanical engineer, Lehigh Valley Coal Co., Wilkes-Barre, Pa., declared that the public would be best served when it received not what is termed "quality anthracite" but "anthracite combustible," or coal containing 12 per cent

of ash. A product of this kind in a household furnace would respond to dampers, burn slowly, and conserve heat. Such a fuel would have a specific gravity of 2 rather than one of 1.60 to 1.65. With such a fuel as an aim, 15 per cent of the raw coal would be saved.

Supposing the profit of this saving were concentrated on the 68 per cent of the coal that is sold for more than its mining cost—namely, the prepared sizes—the cost of that coal could be lowered to the consumer 75c. per ton without any loss to the coal company. It was Mr. Sterling's belief that the consumer was paying a high price to obtain coal of the cleanness which is now provided him, a cleanness that resulted only in a fuel the proper consumption of which he was unable to control. In the Northern field the saving effected by producing a fuel such as he described, instead of the kind of coal now being furnished, would be 80c. per ton, and in the Southern field, about 50c.

Dorrance colliery last year mined 195,045 mine cars of coal and had a prepared-coal yield (egg to nut) of 1.865 tons per 100 cu.ft.. of mine-car capacity. Had the plant made an anthracite with 12 per cent of ash, the yield would have been increased per car by 0.19 ton per 100 cu.ft., or 0.20 ton per mine-car, and so have shipped 39,000 tons more annually. Had this standard of cleaning been applied to all anthracite, the users of that fuel would have been saved $30,000,000.

Too little has been said, according to Mr. Sterling, as to crusher losses; attention has been centered rather on the losses in washing. These, it is true, are important. Dorrance breaker in 1928 produced only 1.890 tons and in 1929 only 1.865 tons of prepared sizes per 100 cu.ft. of mine-car capacity. With the new Rhéolaveur washer, the recovery rose to 2 tons, a gain of about 0.15 ton, which is 0.172 ton per mine-car, or 38,500 tons a year, based on the 1929 dumpings. Though coal is now being cleaned at a gravity at around 1.60 and though bone and slate allowances have been cut, the yield has increased, which speaks well for washing performance.

Despite this improvement in yield, the elimination of crusher losses would seem a way to make even greater savings. If 855 tons of coal and 145 tons of refuse are obtained from 1,000 tons of feed and the refuse has 5 per cent of coal, or 7.25 tons in 145 tons, the approximate value of the entire elimination of coal from the refuse would be $45. On the other hand, it must be remembered that if the 855 tons was shipped as "broken" coal and lower, the return would be $6,200 on the 855 tons, whereas if the coal were crushed to stove and smaller, it would be worth only $6,075, and the loss would be $125.

Mr. Sterling urged that anthracite should not be dropped through rolls, the fall and the speed of the rolls together reducing egg size 2½ per cent; stove, 2.8 per cent; and nut, 5.2 per cent. Mr. Sterling has designed a set of rolls, one smooth and one toothed set on a 45-deg. incline, the smooth roll serving as an anvil and the teeth of the other roll functioning as a hammer. The coal passes easily over the smooth roll onto a plate. Shop tests showed the efficiency as 93 per cent. But even this is not perfect. The ideal roll, Mr. Sterling said, would be one in which the pieces to be broken would be supported on their ends and pressed in the center by a bar, so as to crack them without crushing.

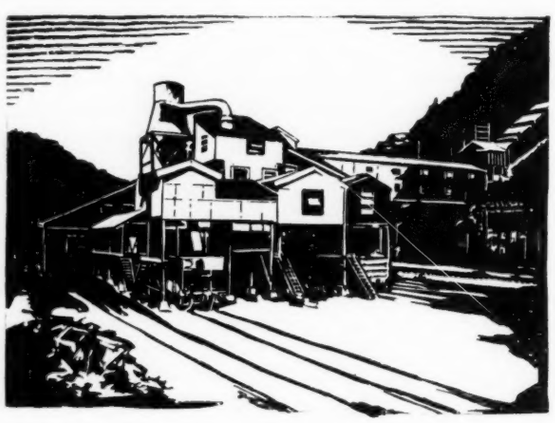
The speaker believed that a higher percentage of undersize should be allowed in the preparation of coal, for not always can 60 per cent of the oversize be removed; 75 per cent is extremely good proportion, and even with hand screening not more than 90 per cent can be eliminated. For this reason, screens are made with apertures larger than the specified size, in the expectation that all the coal below the standard-screen size will somehow get through the coarser screen, but with this arrangement a large quantity of coal rightly belonging to one size goes to the next, which is a wasteful practice.

Charles Enzian, mining engineer, Consolidation Coal Co., Fairmont, W. Va., wanted to know why vibrating screens could not be used for the sizing of this material. Mr. Sterling replied that the standards were based on round holes, whereas vibrating screens were of wire and did not have punched plates.

The Rhéolaveur plant of the Houston Collieries Co., at the Carswell mine in West Virginia, described by A. F. Castanoli, engineer in charge of preparation of that company, is making an intermediate product for use under its own boilers and is washing all coal without sizing from ¼-in. to 6-in. The boiler coal is crushed before being used and it is mixed sometimes with the fine coal from the bottom deck of the washed-coal sizing shakers and the fixed dewatering screens, after this coal has been settled in a concrete tank and transported in a dewatering bucket elevator. The minus ¼-in. coal is shipped without washing. The main product is washed at a specific gravity of 1.50 and the boiler product at 1.65. Before the boiler plant was completed all the coal was washed at 1.65 gravity, and the sink in the egg, stove, and pea sizes was only 1.10, 0.91, and 0.75 per cent, respectively. Float on the same gravity in the refuse was 4.10 per cent. The average sink in all sizes of washed coal was 0.88 per cent, whereas the sink in the raw coal was 8.50 per cent.

The boilers take 80 tons of bone, or 10 per cent of the washed sizes. In order to cut down degradation, no storage bin was placed ahead of the main washing launder. This makes operation exceedingly intermittent and irregular. Remote controls at a centralized point regulate the flow of water to the launder; thus a single operative can adjust the plant to suit feed fluctuations. Further data with respect to Carswell were published in the preceding issue of *Coal Age* (Vol 35, p. 224).

R. H. Kelley, general superintendent, Greenbrier Coal & Coke Co.,



Bramwell, W. Va., said that all the 2½x1-in. coal at his plant at McDowell, was washed by jigs. The slack was not washed, as wet slack in the Greenbrier field was a drug on the market. In order to assist in the washing, fine coal was circulated in the jigs. Before the jigs were introduced, a clean-coal campaign was inaugurated, because it was recognized that the miners would be disposed to let up in their efforts to produce clean coal as soon as the washer was installed. Mr. Kelley said he had imitated his neighbor's plant, but found that he had obtained, with what seemed the same coal, an altogether different result.

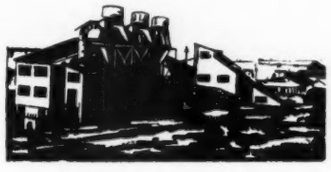
Man-Training Comes to the Front

JUSTICE and fair treatment are at the basis of personnel work, in the judgment of Milton H. Fies, vice-president, DeBardeleben Coal Corporation, Birmingham, Ala., who presided at the meeting of the American Mining Congress, May 7, on "Personnel Training." Dr. J. J. Rutledge, chief mining engineer, Maryland State Bureau of Mines, Baltimore, Md., asserted that mine foremen, superintendents, and firebosses should have training in the proper way of handling labor, how to meet adverse mining conditions, and how to operate a coal mine safely and efficiently as well as mining experience. The order of importance, be it noted, is beginning to be reversed, stress being laid now, as Dr. Rutledge has laid it, on the proper way to handle labor.

Dr. Rutledge said that since 1923 the total number of enrollments in the Maryland mining night schools has been 1,937; the enrollment for the year 1929 to 1930 was 339; the average weekly attendance, 161; and the percentage attendance of all those enrolled, 47. He stated that 64 students had received an aggregate total annual increase in salaries of $54,000, a return of 600 per cent on what the State of Maryland has expended on their education.

Charles Enzian, chief engineer, Consolidation Coal Co., Fairmont, W. Va., stated that one private company had established night schools with fees to cover the cost of books. All the men who get certificates from these schools have their fees returned. R. M. Lambie, chief, West Virginia Department of Mines, Charleston, W. Va., said that the shorter mining cost at West Virginia University was proving a considerable help to applicants for certificates. Of the students of that course who presented themselves for examination, 87 per cent passed; of those who were otherwise prepared, only 52 per cent received certificates. It has been shown that those who take this course not only have fewer accidents themselves than those who do not but also when they are placed in charge of men, the men they control have fewer accidents than the men working under other bosses.

Not training but education was advocated by H. E. Nold, professor of mining, Ohio State University, Columbus, Ohio. Students should not be so much taught to absorb facts



and theories as to raise questions in their own minds, learn to seek answers to them, and find their own solutions. The student should be seeking knowledge rather than having it thrust upon him. When he finds in answer to his seeking is worth many times the information which is imparted gratuitously.

Public schools in mining regions, said C. E. Lawall, head of the School of Mines, West Virginia University, should be teaching the elementary principles of mining to their students. They were, however, teaching agriculture instead of mining to boys in towns where there was not a good farm within twenty miles. This public-school teaching would prepare the boys for extension training and the shorter mining course, or for graduation in the School of Mines. Last year ten foremanship classes were formed in as many districts of West Virginia.

A need more crying, according to Fred A. Krafft, director of industrial relations, Consolidation Coal Co., Fairmont, W. Va., was for fundamental education for those to whom it had been denied. Reading, writing, and Americanization classes should be established at the public schools. All the big industrial corporations had become interested in fundamental education for illiterates and the foreign born. Mining industry should recognize the importance of this phase of education to itself and to the members of its mining communities. Unfortunately, said Professor Nold, the Smith-Hughes Act did not provide for the use of federal funds for any purpose but industrial education.

The chairman introduced F. E. Bedale, engineer of safety, Consolidation Coal Co., Fairmont, W. Va., as the safety organizer for a company having the excellent record of 1,500,000 tons per fatality. Mr. Bedale described the model working place maintained near the entrance of every mine belonging to the Consolidation Company, where all new employees are instructed in the mining rules—how to block cars, how to timber, how to place shotholes, how to separate and dispose of rock, boney and other refuse, what tools every miner must have, how to store his explosives, and where to keep his cable, battery and other equipment. Other safety rules are explained to the miner while visiting the model working place.

Mr. Bedale said that all operating officials of the Consolidation Coal Co. have to attend a safety standards school and have to pass an examination showing knowledge of the standards. They carry a full set of these with them in visiting working places. Other details of the safety program inaugurated by the Consolidation Coal Co. have been described already in *Coal Age*, especially the safety courts, where men are tried for offenses against safety rules.

Exception was taken by J. A. Long, general manager, Woodward Iron Co., Woodward, Ala., to the personal contact between the coal inspectors and other personal contact men on the one hand and the mine workers on the other. He felt that, at least in Alabama, where negro labor was employed, all contacts should be through the section foreman; otherwise, there would be a conflict in authority that would be perplexing to the workman and would unsettle his loyalty. His company had done away with safety committees and slogans, though not with safety signs. Yet accidents had been reduced. Whenever a man is injured, the foreman, if to blame, is laid off for as long a period as the injured man.

"Mutuality committees" have been formed and been operating for four years. When a man has taken up a

complaint with his foreman, if he does not receive what he desires, he lodges his complaint with the mutuality committee. It would go hard with any foreman who tried to "ride" any man for referring his grievance to the committee. The company did not choose the "yes-men" in its organization for positions on the mutuality committee but selected rather those who were disposed to find fault with the management.

Monthly meetings of the committees are held on company time. Every man on these committees carries a badge bearing the words "Mutuality Committee" prominently displayed, so that every man knows where to seek redress, if redress is desired. At the same time, no one may take up any matter with the committee until he has presented his case to his foreman. The chairman of the meeting said he could not see why Mr. Bedale's plan should not be applied in Alabama as well as in the Fairmont region.

J. J. Forbes, safety engineer, U. S. Bureau of Mines, Pittsburgh, Pa., acting in behalf of the Holmes Safety Association, presented a certificate to Edward A. Bottomley, general manager, Sheridan - Wyoming Coal Co., Sheridan, Wyo., for conspicuous safety in operation of that company's mines. Mr. Bottomley, on being asked whether mechanized mining had anything to do with safety, said that he thought it had, because mechanization promoted specialization in the working forces. Every man had a certain kind of job to perform, made a study of it, did not slight it, and did it in the regular order without reckless haste. The miner regarded post setting as a secondary job, which he delayed for work which, to him, seemed more important, and fatalities accordingly resulted. The timberman could make no such mistake, as he had no other duty except to erect timber.

In closing, the chairman remarked, the subject of personnel was all-important. In time mines were worked out, entries fell in, and tipples rotted, but the work of personnel training lasted forever.

How to Achieve Safety Records

ACCIDENT prevention studies brought out a large attendance at the last morning session of the American Mining Congress Convention. A. J. Musser, vice-president, Clearfield Bituminous Coal Corporation, Indiana, Pa., presided. On behalf of Scott Turner, director, U. S. Bureau of Mines, J. J. Forbes, safety engineer of that organization, awarded to the Hull No. 23 mine of the DeBardeleben Coal Corporation the Annual Bituminous Safety Award Trophy donated by the *Explosives Engineer*. Mr. Forbes stated that the record of the bituminous contestants was as follows:

Severity Rate	Name of Mine	Location	Coal Company	Lost-Time Accidents	Days of Disability
0.097	Hull No. 23	Dora, Ala.	DeBardeleben	3	21
0.285	Corona No. 16	Coal Valley, Ala.	DeBardeleben	5	108
0.305	Corona No. 12	.....	DeBardeleben	3	67
0.395	Dawson No. 5	Dawson, N. M.	Phelps-Dodge	2	67
0.482	Stewart	Southwest, Pa.	W. J. Rainey, Inc.	5	207

The last mine in the list, the Stewart mine of W. J. Rainey, Inc., he said, had been operated for 10 years and 4 months and had produced 4,500,000 tons, working 5,000,000 man-hours, with only one serious disabling injury and no fatalities. It is now abandoned after an almost perfect record of safety in operation.

Milton H. Fies, vice-president, DeBardeleben Coal Corporation, Birmingham, Ala., who accepted the trophy in the name of the Hull mine, said that it was a drift operation with 2,000 ft. of roadway which led to a fault with a 50-ft. throw. About 165 men are employed. Locomotives haul the coal from the fault to the surface. The haulage beyond the fault is by mules. The thickness of the drawrock in the mine runs from 4 to 6 in. Every man employed at the mines has had first-aid training. The company has found that for eight accidents sustained by men having no first-aid instruction there will be only one accident among those who have been so trained.

Many of the men working at the mine live a long way from the workings. Such men were furnished with suppers so that they could stay late for the training. Mr. Fies ascribed the safety in the mine in part to a recent change in management methods by which disciplinary measures are left to the higher officials, operating with definite rules, and not to the mine foreman. The foreman too often finds himself in a pinch to fill vacancies, due to unexpected absences of employees, and to fill them he lays himself under obligations to the men, which obligations he feels he must pay by pardoning breaches in the safety rules. However, since the new and inflexible rule has been made, only two men have been discharged, because the men now know that no past accommodations can buy them freedom from penalty for actions which endanger other men's lives. No mere gift of service can atone for jeopardizing a life.

Another cause for safety at the mines of the DeBardeleben Coal Corporation is systematized timbering. A miner must set his props at 4-ft. centers whether he believes they are needed or not. This is an invariable

rule, though he is required to place as many more as he or the foreman believes to be needed. The seam in Hull No. 23 is from 6 to 9 ft. thick.

Another safety method that has contributed to the success at Hull has been to have the inspectors put a red tag on any unsafe equipment or bad piece of roof. The red tag ends in a detachable stub which when severed and sent to the superintendent tells him briefly what is the unsafe condition and where. On the back of the red tag is a place for a notation stating that the defect has been repaired, and this the repairman uses to announce to the superintendent to whom it is sent that the defect has been corrected. Sometimes the tag announcing the completion of the repair outraces the stub announcing the dangerous condition.

Some credit must be given to the negroes in the Hull mine and in other mines of the company. They have fewer accidents than the whites. Of course, the company has safety committees, but one of the most helpful features in the safety effort, said Mr.

Fies, is the dinners at Jasper, the county seat of Walker County. At these each superintendent has to rise and explain just how his accidents happened. That recital makes him careful to investigate his casualties and to analyze them. Another practice is to discuss those accidents which, though they cause the men to lose no time, are fraught with potentiality for injury and death.

Recently insurance rates have been raised 50 per cent in Alabama. The corporation decided to avoid paying the higher rate by becoming a self-insurer. It pays into insurance funds, which are kept separate, amounts equivalent to the former insurance rate and charges against this rate the safety dinners and a high catastrophic hazard rate. Nevertheless, the fund has accumulated $15,000 to $17,000, and this because the mines are unusually free from accident. In reply to an inquiry, Mr. Fies said that the mines employ no colored inspectors.

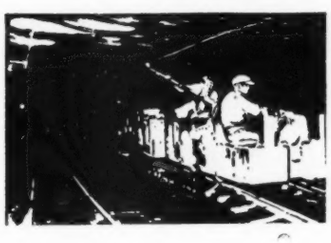
A. S. Wilson, general superintendent, Boone County Coal Corporation, Sharples, W. Va., described the methods employed in developing and maintaining safety codes. A. W. Dickinson, mining engineer, American Mining Congress, discussed the relation of mechanical mining to safety. He urged that suitable junction boxes be used in place of the "nip" connections and that the wires between the main feeders and the service cables be laid in flexible conduit. Positive ground and protective devices should be provided on cutting, loading, and drilling machines. Mr. Dickinson said that the industry did not have enough experience in loading machines to put its men to work on a contract basis and declared that the old system of paying for all loading by the ton had been a fertile cause of accidents, because workmen are prone to try to convert momentary risk into pecuniary gain.

S. W. Blakslee, general manager, Pennsylvania Coal & Coke Co., Cresson, Pa., maintained that mechanical loading was safer and cheaper than hand loading, and he gave figures from his own mines to prove it. E. A. Siemon, general superintendent, Hillman Coal & Coke Co., Pittsburgh, Pa., said that from 1921 to 1925, when there were no conveyors in the Jerome mine, the production per accident ran from 2,588 to 5,921 tons. In 1928, with conveyors, production had risen to 12,929 tons per accident. The rapid extraction, the elimination of individual car handling, and the employment of a better type of men for mechanical loading explained the reduction.

F. S. Pfahler, general manager, Superior Coal Co., Gillespie, Ill., said that at Mine No. 1 about 800,000 tons was produced by hand loading, as against 736,000 tons by machine loading. In loading by hand one fatality occurred and in loading by machine none. In the hand loading of coal, 20 disabilities occurred as an average over 5 years; in machine loading, only 15. The number of compensable accidents with hand loading was 120, and with machine loading only 48. The total number of accidents for hand loading was 200 and for machine loading 102. The tons loaded per accident in the case of hand loading was 4,015, and in the case of machine loading 7,223. Clyde McDowell, chief of safety and personnel department, Pittsburgh Coal Co., Pittsburgh, Pa., gave the safety record of Banning No. 2 and showed accident reductions due to mechanization. He said that the hernias and strained backs probably were sustained mostly outside the mines.

Physical examinations of workmen by coal companies are becoming more general, said Thomas E. Lightfoot, engineer in charge of accident prevention and compensation, Koppers Coal Co., Pittsburgh, Pa. A company doing a big business in coal-mine insurance underwrote in 1925 three companies which made physical examinations of employees, and in 1929 no less than 58 companies employing some 30,000 men. Doctors, whether paid by the company or the employees, usually are willing to make such examinations without additional compensation, as they thereby save themselves from having to service men who may be perpetual liabilities.

The number of men who apply for work with such defective vision as to be almost blind is amazing. Hernias, said Mr. Lightfoot, alleged to be of mine origin, usually are nothing other than aggravations of former ruptures. Examination prior to employment may prevent men from claiming damages. A bad heart usually is associated with other diseases, and it reduces the resistance to electric shock.



In 1929 examinations made by twelve coal-mining companies showed the following causes of rejection, with the percentage importance: Heart defects and diseases, 18.7 per cent; defective vision and blindness, 18.7; hernia, 20.8; high blood pressure, 16.5; deformed or missing members, 10; tuberculosis, 3.1; miscellaneous defects, 12.2 per cent. Of 8,502 men examined, 567, or 6.6 per cent, were rejected. Mr. Lightfoot said that old employees, as well as new, should be examined to ascertain defects, but that it would be wrong to lay off any employees for lack of such health as would enable them to qualify.

William Roy, Hanna Coal Co., St. Clairsville, Ohio, stated that his company had established physical examination. He said that there would be few men left if all the men already employed were examined. The workers should be made to realize the advantages of a physical examination. It should never be introduced as a welfare program but as good business. It should not be used as a blind to establish an age limit, nor as a means to exclude men on personal grounds.

D. L. Boyle, general manager, Penelec Coal Corporation, Johnstown, Pa., described the method of rock-dusting and the placing of rock-dust barriers at the mines of his company. He said that as the coal was only 42 in. thick and rock had to be removed by blasting, it was found that even before artificial rock-dusting the haulageways had 8 to 31 per cent of incombustible dust. The 133 barriers which are in place are being retained, but the intention is to lay the most stress on rock-dusting by high-pressure distributors, of air-courses, rooms, and manways.

The cost per lineal foot has varied from 1.34c. to 2.11c. and per ton of coal mined from 0.90c. to 1.79c., the larger figure being for the first year. The barriers cost $95 each and contained in each instance enough dust to afford the air 100 lb. per square foot of entry cross-section. Mr. Boyle said that his company was the fourth in Pennsylvania to get credit for rock-dusting in its rating from the rating bureaus.

MILESTONES IN MECHANICAL MINING

+ New Equipment Shown at Cincinnati

ONE YEAR'S improvements in equipment for the mining and preparation of coal were recorded at the Seventh Annual Convention of Practical Coal Operating Men and National Exposition of Mining Equipment, held in Cincinnati, Ohio, May 5-9, under the auspices of the Manufacturers' Division of the American Mining Congress. One hundred and forty-six exhibitors, an increase of 36 over last year, employed photographs, models, full-size machines, and the printed word to put across to the delegates attending their cost-cutting and labor-saving ideas. Improvements in the popular pit-car loader, and in the heavier, mobile-type loading machine, were pointed out by the manufacturers. Greater speed, higher capacity, and ability to operate in thinner seams were incorporated in the rolling stock displayed. Preparation advances made during the year were brought out, as were the improvements in electrical equipment designed to conserve power and cut cost. New and better pumping machinery caught the eye of the mining men attending the exposition, while the latest in safety methods and equipment intrigued their attention.

Machines Speed Production

LOADING MACHINES, as in the past, claimed a large share of the attention of delegates visiting the national exposition of coal-mine equipment. The Central Mine Equipment Co., St. Louis, Mo., showed a new, Type A, Fairfield mine-car loader (Fig.1). This machine, which has a maximum and minimum height of 60 and 40 in., respectively, is equipped with a 1½-hp. motor, and is said to have the following unusual features: high flights, which prevent coal rolling back; large holding capacity; large-capacity motor; open loading end; low loading hopper; light weight; roller-bearing carriage wheels; 20-in. adjustment at the discharge end; relatively fast flight motion; and ability to remain in service without attention.

Complete ball-bearing equipment throughout is a feature of the new pit-car loader displayed by the Mt. Vernon Car Mfg. Co., Mt. Vernon, Ill. According to the company, the loader is very sturdy and requires only 2 amp. running idle and 3 to 3½ when working at capacity. Weight, it is claimed, has been greatly reduced to the figure of 1,540 lb. With trailer wheels, the company points out that it is very easily moved from room to room. Improvements in the turntable-type pit-car loader displayed by the Duncan Foundry & Machine Works, Inc., Alton, Ill., include an additional width of pan of 4 in., a change in the raising and lowering device and the addition of tramming mechanism, both operated by the same motor.

The Chicago Automatic Conveyor Co., Cicero, Ill., exhibited the new Model 70 pit-car loader equipped with ball bearings throughout. This machine is driven by a 1½-hp., inclosed-type, fan-cooled motor. A self-locking rack and pinion, operated by a lever at the side of the machine, gives an adjustment of approximately 28 in. on the loading boom. The weight is 1,700 lb. Advantages noted by the manufacturer are: low receiving end, long enough to allow several men to shovel without interference; roller chain speed reduction; automatic lubrication for drag and drive chains; flights high enough to handle the largest lumps; balanced weight on the axles, and fully inclosed moving parts.

Among the pit-car loaders displayed by the Northern Conveyor & Mfg. Co., Janesville, Wis., was the new Model B, Style BJ, self-propelled, heavy-duty machine, with a 20-in. trough and reinforced loading end. Features pointed out by the Northern company are safety, adjustable loading boom, any type of driving motor desired, and perfect bal-

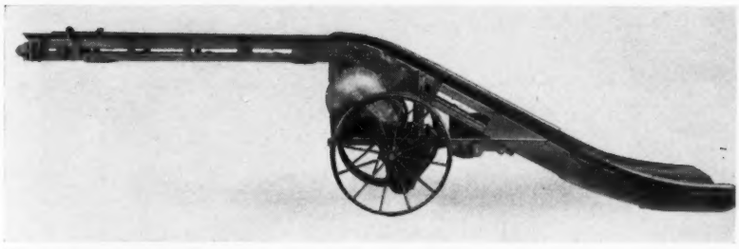


Fig. 1—Fairfield Pit-Car Loader

ance. The loader is equipped with an auxiliary set of trucks under the front end, which are lowered to the track when it is desired to move to another place. A heavy-duty face or feeder conveyor—Model L, Type LH—also was shown by the company. It is built in sections to permit lengthening or shortening, and may be had in any length from 10 to 40 ft.

The Brown-Fayro Co., Johnstown, Pa., showed the Model LF-8 permissible mine-car loader, a portable machine with a self-contained power unit, self-cleaning hopper, and totally inclosed working parts. This company also had on display room hoists and the "Brownie" car retarder. "Coal-getters" were shown by the Mancha Storage Battery Locomotive Co., St. Louis, Mo. The Bertrand P. Tracy Co., Pittsburgh, Pa., exhibited one of its line of pit-car loaders.

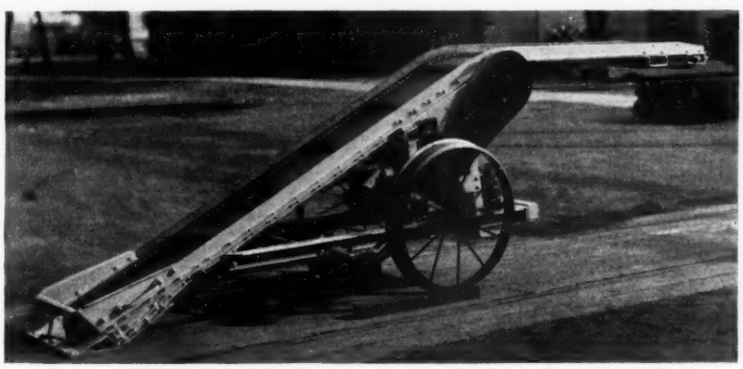


Fig. 2—Mt. Vernon Mfg. Co. Pit-Car Loader

Ironton 90-deg. turns for use with its shaker conveyor were displayed by the Ironton Engine Co., Ironton, Ohio. With this device, face conveyors may be eliminated, the company says, because the inby end of the conveyor may be turned either right or left across the face, thus combining the face conveyor with the main conveyor. At the booth of the Rock Springs Loader Co., Rock Springs, Wyo., use of the Duckbill loader with shaker conveyors was explained.

Corresponding in size and purpose to the old CE-7 Ironclad coal cutting machine, new CR-3 equipment was shown by the Sullivan Machinery Co., Chicago. The CR-3 machine (Fig. 3) is 72 in. between the coal face and the timbering when sumped in, 24 in. high at the face and 44 in. wide over the feed drums. Two rope feed drums, one on each side, are provided with the machine, each of which will hold 40 ft. of $\frac{5}{8}$-in. rope. Each drum has an independent control, with a fast speed for moving about and a slow speed for cutting.

The Sullivan company also demonstrated the new CD-4 coal drill, shown on page 273 of this issue of *Coal Age*. It is a self-contained, electric-driven machine mounted on a self-propelled truck. One motor of $8\frac{1}{2}$ hp. operates both the drill and truck. The drilling arm is $11\frac{1}{2}$ ft. long and feed screws 5 to 9 ft. long are available. Both the drill and arm are fully swiveled, so that holes may be drilled in any direction or at any point in the face. Drilling speed, according to the manufacturer, is 5 ft. per minute, and the tramming speed is 600 ft. per minute on a level track.

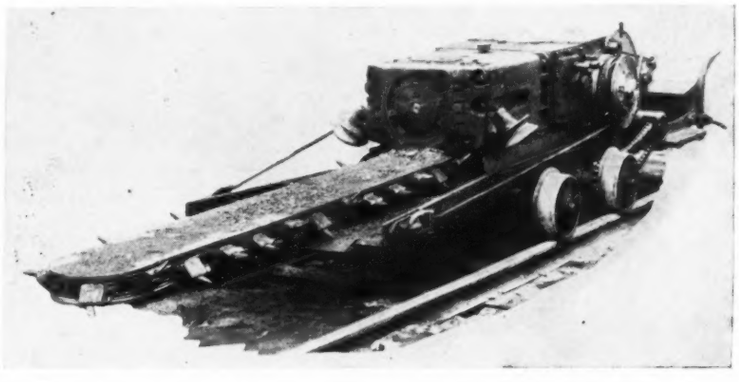
In addition to the equipment mentioned above, the Sullivan company exhibited room hoists for scraper loading and the new CR-2 cutting machine. The new HDE-75 model hoist displayed is shown in Fig. 4. It is equipped with a 75-hp. motor, two drums $19\frac{1}{4}$ in. in diameter, and is 8 ft. long and 4 ft. wide. Under full load it has, according to the company, a rope pull of 8,250 lb. and a rope speed of 300 ft. per minute. The CR-2 coal cutter stands $15\frac{1}{2}$ in. high at the face and has a total height of $24\frac{1}{2}$ in. when loaded on the truck.

Variable speed control for all operations is a feature of the new universal control, low-vein, shortwall mining machine displayed by the Goodman Mfg. Co., Chicago. All controls are said to be conveniently arranged at the back of the machine. Other features emphasized by the exhibitor are: power-driven head and tail ropes, both equipped with brakes; two speeds on each rope drum, both of which on either drum are variable; 16-in. over-all height in both open and permissible types; 50-hp. motor; ability to make its own bottom; and arc-shaped passageway through the side of the machine for the discharge of cuttings.

Ability to pick up coal and high capacity are features which the Jeffrey Manufacturing Co., Columbus, Ohio, claim for the new 44-C loading machine which the company displayed. This machine is shown in Fig. 6. Features of the machine, which comes between extremes in pit-car loaders and large, mobile-type loading machine, are given by the company as follows: lightness, low first cost, ability to gather shot-down coal and clean the floor, and continuous loading on the shortwall principle.

The Whaley "Automat" loading

Fig. 3—Sullivan CR-3 Continuous Coal Cutter



machine, described in the February, 1930, issue of *Coal Age*, page 136, was shown by the Myers-Whaley Co., Knoxville, Tenn. Oldroyd loaders and cutters were featured by the National Erie Co., Erie, Pa., and the Joy Manufacturing Co., Franklin, Pa., displayed the improved Type 7-BU loading machine. The Bucyrus-Erie Co., Milwaukee, Wis., showed the operation of its stripping shovels by means of a miniature strip mine.

In addition to its regular line of electric and pneumatic drills, the Chicago Pneumatic Tool Co. displayed the new No. 3 coal pick hammer. The weight of the tool is said to be only 25 lb., and it has only one working part—the piston. It operates at a rate of 3,050 blows per minute and is said to be low in air consumption and to be simple in construction. The Chicago Pneumatic company also exhibited a new drill for use with the Cardox cartridge.

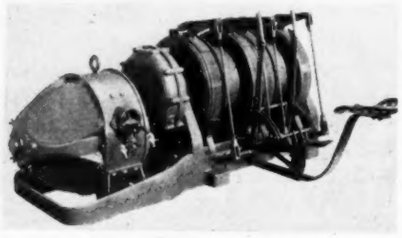


Fig. 4—Sullivan Scraper Hoist

For drilling for the installation of expansion bolts for mine trolley hangers, the Cincinnati Mine Machinery Co., Cincinnati, Ohio, showed the Ohio electric hammer. Features of this machine, as outlined by the company, are: light weight, intermittent rotation of the drill steel, and ability to regulate the force of the blow. The same chuck takes drill steel from $\frac{1}{4}$ to $1\frac{1}{4}$ in. The Safety Mining Co., Chicago, displayed a new Cardox auger, made of a tubular steel center with a steel fin wrapped around it and welded fast. It carries a fishtail, detachable bit, which the company states can be readily removed or attached by the removal of only one bolt. The shank of the drill may be made either square or with the standard flat taper. A six-foot auger of this design, cutting a $3\frac{1}{4}$-in. hole, weighs about the same as the miners' hand auger and requires but little more power to drive, according to the company.

Detachable "Coalmaster" drill bits were displayed by the Central Mine Equipment Co., St. Louis, Mo. According to the company, these bits are made of special-analysis, heat-treated, and tempered steel, and are designed for sharpening on an emery wheel.

"Cosco" conveyors and drives were featured by the Conveyor Sales Co., Inc., New York City. The Jones Flexible Conveyor Co., Pittsburgh, Pa., showed a shaker-type conveyor, described in *Coal Age*, March, 1928, page 156. The Lorain Steel Co., Johnstown, Pa., had face and main conveyors on the floor of the exposition. A tubular conveyor for use with coal was exhibited by the Traylor Vibrator Co., Denver, Colo. The Utility Conveyor & Mine Equipment Co., St. Louis, Mo., featured a line of conveying and loading machines and equipment.

A reversible bit and bit holder for use in any standard drop-forged cutter chain was shown by the Cincinnati Mine Machinery Co., Cincinnati, Ohio, which displayed a line of cutter chains. Cutter chains also were featured at the booths of the Pittsburgh Knife & Forge Co., and the Bertrand P. Tracy Co., both of Pittsburgh, Pa.

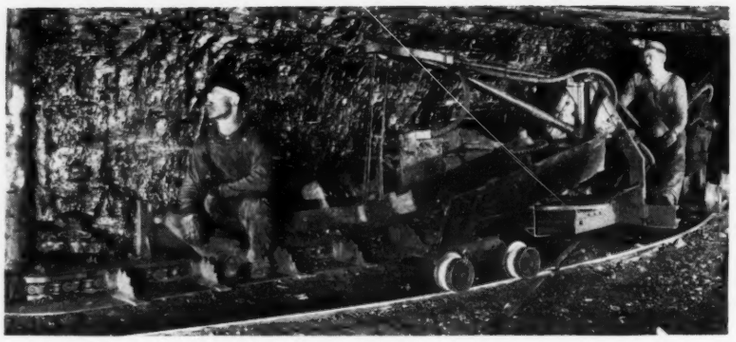
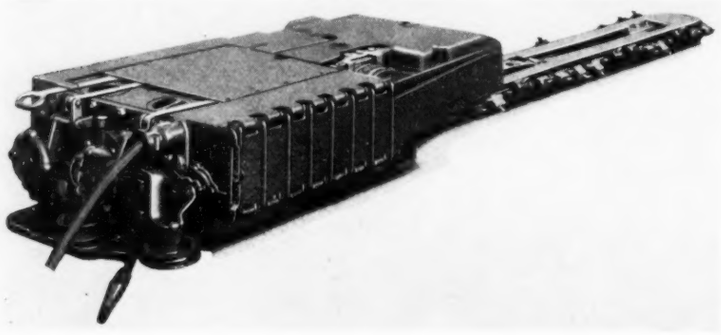


Fig. 6—Jeffrey 44-C Loading Machine

Fig. 5—Goodman Universal Control Low-Vein Shortwall Machine



Rolling Stock Gives Fast Operation

Motors and mine cars were the principal objects of interest in the rolling-stock line at Cincinnati. The Goodman Mfg. Co., Chicago, showed a new six-ton, low-vein, gathering locomotive (Fig. 7), emphasizing the following features: 24-in. over-all height; 60-hp. motor; designed for slow or standard speeds; inside or outside frame, with or without cable reel; 4-in. clearance under end frame; $2\frac{3}{8}$-in. under motors and 2-in. under gear cases; extra large cab space; split shells on motors; large, interchangeable controller fingers; reel and cable switch built in controller; and alloy-steel-grid rheostat.

Safety, efficiency, sturdiness, efficient performance, and economy in operation and maintenance are features claimed for the new eight-ton, slow-speed, gathering locomotive exhibited by the Baldwin Locomotive Works. It is equipped with two 28-hp., 250-volt, ball-bearing, interpole motors. Dimensions are: length, 154 in.; width, 54 in. over bumper, and height, $35\frac{1}{2}$ in. over the reel. Clearance under the motor is 3 in., and under the gear cases is $2\frac{13}{16}$ in. Features pointed out by the maker are: slow- and high-speed operation on the trolley and with the motors always in parallel. Locomotive parts were exhibited by the General Electric Co., Schenectady, N. Y.

An all-steel, electric-welded, mine car (Fig. 8) was shown by the Irwin

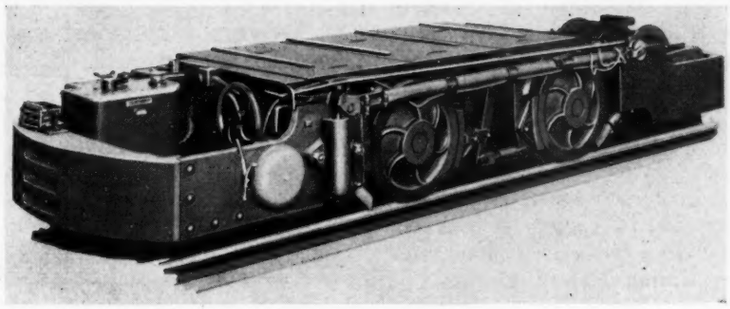


Fig. 7—Goodman Six-Ton Low-Vein Gathering Locomotive

Foundry & Mine Car Co., Irwin, Pa. While the company says that electric welding gives a very rigid construction, the use of Sensenich, self-adjusting trucks provides a flexibility that allows the wheels to follow any irregularities in the track and keeps the car bottom in a horizontal plane at all times. Greater capacity, reduced cost of upkeep and saving in lubricant are advantages claimed by the company.

Ten to 15 per cent greater carrying capacity with the same body dimensions are claimed for the "Blue Boy" mine car (Fig. 9) displayed by the Watt Car & Wheel Co., Barnesville, Ohio. This results, the company claims, from the Z-bar axle design. Other haulage equipment also was shown by the Watt company. In Fig. 10 is shown the Watt-Allen

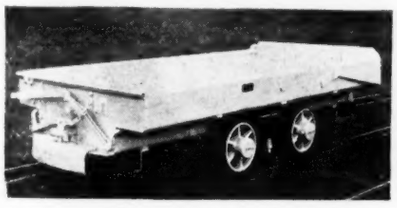


Fig. 8—Irwin Car & Mfg. Co. Mine Car

& Garcia car and dumper. This arrangement consists of a mine car without doors, hinged to one side of the underframe and carrying a small wheel on the body opposite the hinges. This wheel engages a pair of guide bars in the dump, which lift the body up and over to a point where all the coal falls out, and then bring it back and set it on the trucks. No swivel couplings are required.

By use of the automatic switch (Fig. 11) shown by the Watt company, the motorman by an arrangement of levers can turn either to the right or left without the necessity of leaving the cab, no matter which way the switch is set. According to the company, this system eliminates stopping the locomotive and, in many cases, the service of a trip rider. For application on locomotives, the company displayed a bumper (Fig.12) equipped with headlights so placed that they do not blind the workmen. In addition, the company featured an improved, power-driven rail bender (Fig. 13). It is capable of handling 40-lb. rails, the company states, and is so designed that a rail may be turned over in the machine to permit taking out a reverse bend.

Less weight for any given capacity, no rusting between plate connections, and no rivet heads to obstruct the flow of coal are advantages claimed for the new electrically welded mine cars (Fig. 14) exhibited by the American Car & Foundry Co., New York City. A gain in capacity of 25 to 100 per cent is claimed for the new mine cars shown by the Bonney-Floyd Co., Columbus, Ohio. This gain is said to result from the use of stub axles. The company states that the tendency of the wheelbase to change with this type of axle has been eliminated by the use of cast-steel side frames, which support the axles at both ends. Other features of the car, as outlined by the company, are: highest capacity for the same overall dimensions; highest live-load ration; greatest economy in haulage costs; spring draw-bar; spring axle mounting; low center of gravity; and Alemite lubrication.

Mine cars also were shown by the Lorain Steel Co., Johnstown, Pa., Enterprise Wheel & Car Corporation, Bristol, Tenn.-Va.; and the Bethlehem Steel Co., Bethlehem, Pa. The Sanford-Day Iron Works, Knoxville, Tenn., showed a model car featuring a new channel construction for greater strength and higher capacity. Woodford Engineering Co., Chicago, demonstrated the use of its side-dump cars as applied to a stripping operation. Operating views and a model of a 55-ton steam locomotive were on display at the booth of the Heisler Locomotive Works, Erie, Pa.

The Keystone heavy-duty steel mine tie for use in maintaining standard-gage tracks at mining operations was introduced by the Bethlehem Steel Co., Bethlehem, Pa. This tie is shown in Fig. 15. The company suggests that these ties be substituted for every third or fourth wood tie, and cites the follow-

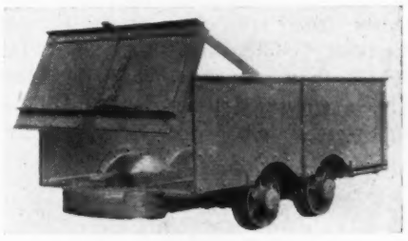
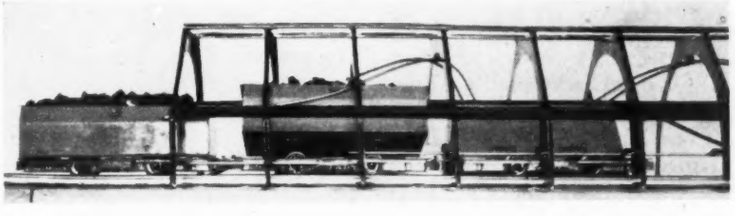


Fig. 9—Watt "Blue Boy" Mine Car

ing advantages: removal of the strain of rail fastenings from the wood ties, thus adding to the life of the track; prevention of spreading or rolling of rails when used on curves; and longer life. They may be applied without removing the ballast, and the gage may be changed a total of ½ in., as shown in Fig. 16, by adjusting the clips. The Bethlehem company also had on display the rail extension tie for mine use shown in Fig. 17. This new tie permits the track to be laid close to the face, the company says. A special tie with two removable clips is used to hold the extension rails tight against the permanent ones.

In addition to the steel ties mentioned above, the Bethlehem company showed samples of trackwork, turnouts, switchstands, and other material, as did the Carnegie Steel Co., Pittsburgh, Pa., and the Central Frog & Switch Co., Cincinnati, Ohio. The West Virginia Rail Co., featured a new light-type, parallel-throw switchstand for room turnouts, said

Fig. 10—Watt-Allen & Garcia Car and Dump



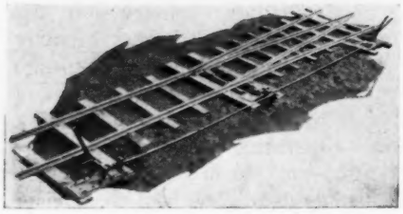


Fig. 11—Watt Car & Wheel Co. Automatic Switch

to give greater safety to the haulage operative.

The new mine-car wheels shown by the National Malleable & Steel Castings Co., Cleveland, Ohio, contain, according to the company, steel with great ductility and high yield point, thus eliminating the possibility of the tread sprawling or the flange breaking. They also are said to be lighter than cast-iron wheels. New wheels equipped with Timken bearings were shown by the American Car

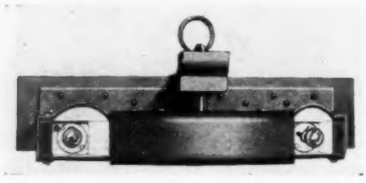


Fig. 12—Watt Motor Bumper

& Foundry Co., New York City. The Bonney-Floyd Co., Columbus, Ohio, displayed the new MM alloy-steel, heat-treated mine-car wheels with Timken bearings. These wheels, the company says, are given a differential heat treatment, resulting in easily machineable bores and hard rims and flanges.

Mine-car trucks, hitchings, links, pins, axles, and other mine car parts and haulage specialties were shown

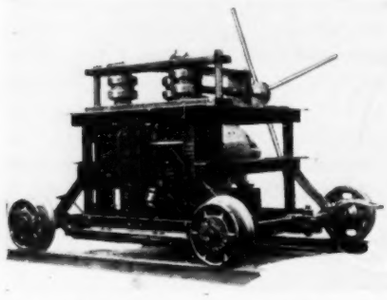


Fig. 13—Watt Power Rail Bender

by the Brown-Fayro Co., Johnstown, Pa., Central Frog & Switch Co., Cincinnati, Ohio; Hockensmith Wheel & Mine Car Co., Penn, Pa.; Ohio Brass Co., Mansfield, Ohio; Pittsburgh Knife & Forge Co., Pittsburgh, Pa.; Bertrand P. Tracy Co., Pittsburgh, Pa.; Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.; Phillips Mine & Mill Supply Co., Pittsburgh, Pa.; Mt. Vernon Car Mfg. Co., Mt. Vernon, Ill.; American Car & Foundry Co., New York City; and the Flood City Brass & Electric Co., Johnstown, Pa.

A car-control caging system for intermediate levels was demonstrated by the Mining Safety Device Co., Bowerston, Ohio. The unit consists of automatic cagers, automatic cage

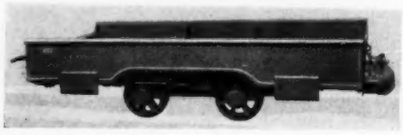


Fig. 14—American Car & Foundry Mine Car

locks and safety gates, and manually controlled landing chairs. Landing chairs are thrown in and out of position by a lever and are so interlocked that when they are in position to receive the cage the trip crank with which the cage contacts is thrown out in the shaft. The cage locks automatically stop the car and are de-

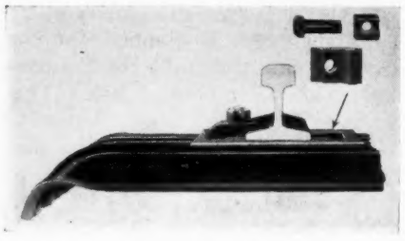


Fig. 15—Bethlehem Heavy-Duty Steel Tie

signed to receive one car from either side of the shaft in mines where the haulage may be reversed. Besides the caging system, the Mining Safety company had on display models of dumping systems and other caging devices. The Phillips Mine & Mill

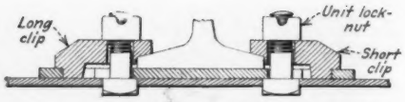


Fig. 16—Bethlehem Heavy-Duty Tie, Showing Construction for Variation in Gage

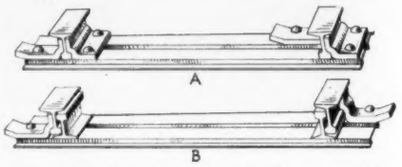


Fig. 17—Bethlehem Steel Tie for Mine Use; Upper Is Used in Extension Track

Supply Co., Pittsburgh, Pa., exhibited a model of the Phillips Barkley gravity rotary dump and also of the cross-over dump of its manufacture. A working model of the Olson OC-6 self-dumping cage was shown by the Eagle Iron Works, Des Moines, Iowa.

Fairbanks, Morse & Co., Chicago, offered for inspection their mine-car dial scale for weighing coal and cars. The Streeter-Amet Weighing & Recording Co., Chicago, displayed an automatic weight-recording attachment for mine scales.

Fig. 18—National Malleable & Steel Castings Co. Mine-Car Wheel

Mechanical Preparation Advances

Preparation was represented at the Cincinnati exposition by models and photographs in addition to full-size equipment. Motion pictures were employed to put over the story of the Hydrotator, manufactured by the Hydrotator Co., Hazleton, Pa. A description of the equipment appears in the March, 1929, issue of *Coal Age*, page 163. The Hydrotator also called attention to its new air-sand process of coal cleaning. The Pennsylvania Mining Machinery Corporation, New York City, featured the Peale-Davis air table. A scene-in-action view of a Rhéolaveur plant was displayed by the Koppers-Rhéolaveur Co., Pittsburgh, Pa., as well as photographs and drawings of previous installations.

A working model of the Simon-Carves washer was offered for inspection by the Link-Belt Co., Chicago. The Morrow Manufacturing Co.,

Wellston, Ohio, presented a complete working model of a Morrow tipple. The Fairmont Mining Machinery Co., Fairmont, W. Va., had on display a picture story of its products for the preparation of coal. Pittsburg preparation equipment also was shown in pictures at the booth of the Pittsburg Boiler & Machine Co., Pittsburg, Kan.

Menzies hydro-separators were featured by the Roberts & Schaefer Co., Chicago, who had on the floor a commercial size, double-compartment, rewashing type for washing of sized coals; primary washing on rewash systems; secondary washing of fine sizes only, and for other washing and separating combinations. In addition to the machine on the floor, the company called attention to the single-compartment machine and the new triple unit (Fig. 19). The latter is for use where a self-contained washing unit is required; for secondary washing with a battery of primary washers; where two grades of products are desired, or three grades when used as a secondary washer, and in other combinations.

The Deister Concentrator Co., Fort Wayne, Ind., showed the new "Concenco" flat coal picker, illustrated in Fig. 20. This picker is for the separation of flats from cubical coal, and the company claims that a capacity of 50 tons per hour has been obtained in removing ½-in. flats from nut coal. The Deister company also featured the new 4x9-ft. Leahy "No-Blind" vibrating screen (Fig. 21), of the double-surface, double-vibrator type, direct motor driven. A 1½-hp. motor is connected to the initial vibrator, which in turn is connected to the other by a roller chain drive.

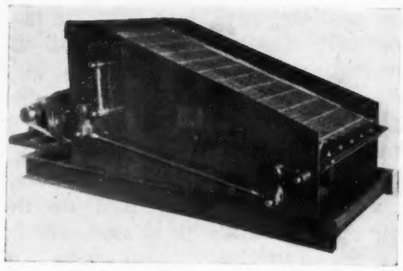


Fig. 20—Deister "Concenco" Flat Coal Picker

The Niagara Concrete Mixer Co., Buffalo, N. Y., offered for inspection the model 5, 5x10-ft., two-deck vibrating screen with balanced wheels, said to eliminate vibration and allow the screen to be suspended without affecting the structure. These screens, the company claims will prepare any coal from ⅛ to 4 in. in size and, because of the small eccentric action—¼ in.—says that heavy loading will not affect the sizing. The screen cloth is put on in panels, so that when the feed panel is worn, it may easily be replaced. Simplicity Engineering Co., Durand, Mich., displayed one of its line of vibrating screens. Ross Screen & Feeder Co., New York City, showed its feeder for use with coal and coke, and the W. A. Jones Foundry & Machine Co., Chicago, exhibited a single-deck, vibrating screen from its line.

A new Type 60 "Hum-Mer" electric vibrating screen was shown by the W. S. Tyler Co., Cleveland, Ohio. The screening surface floats free of the body and, according to the company, under the impulses of the electric vibrators gives a heavy-duty action that is ideal for big loads of coarse material. One vibrating screen, the FB2, was exhibited by the Traylor Vibrator Co., Denver, Colo. The Pittsburgh Coal Washer Co., Pittsburgh, Pa., exhibited its standard 4x10-ft., single deck, tandem, vibratory screen. Perforated metal screens; elevator buckets, both plain and perforated; "Mitco" interlocked steel grating, "Shur-Site" stair treads; Hendrick flanged lip screens; perforated plates for vibrating decks; milled, slotted screens; and perforated metal grilles were shown by the Hendrick Manufacturing Co., Carbondale, Pa.

The new Type "R" air separator was shown by the American Coal Cleaning Corporation, Welch, W. Va. According to the company, this machine uses practically all of the rectangular table surface for cleaning, with an increase in efficiency and capacity over other types. It is built with a deck 72x144 in.

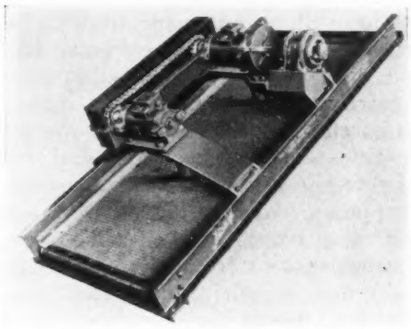
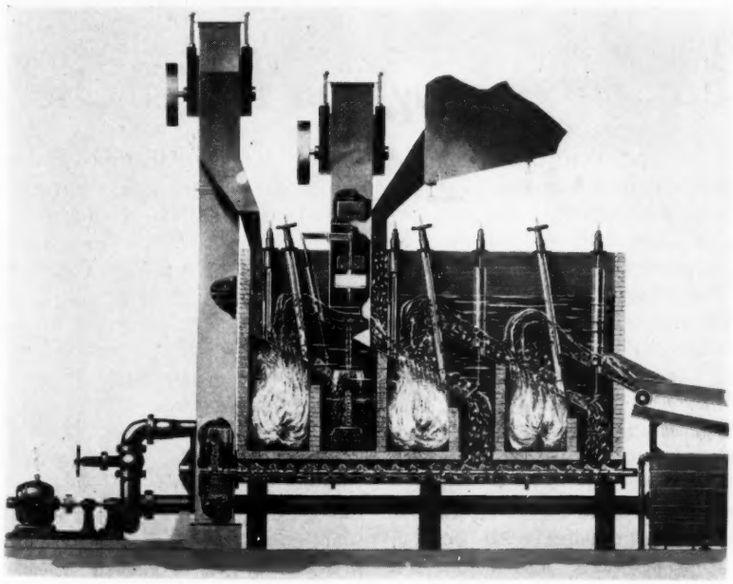


Fig. 21—Leavy "No-Blind" Vibrating Screen

Bradford breakers and a new hammermill crusher of the "Trojan" series (Fig. 22) were shown by the Pennsylvania Crusher Co., Philadelphia, Pa. The design of the latter machine, the company states, permits handling mine-run coal in comparatively small amounts with large hopper openings, and includes provision for two-stage reduction in a single unit.

The "Zig-Zag" car loader, which permits the lowering of coal clear to the bottom of a railroad car, was displayed by the Anthracite Separator Co., Hazleton, Pa. The equipment consists of a number of what might be called elevator buckets with the bottoms cut out and hinged together. This string of buckets travels in guides and may be raised or lowered by a hoist. Coal travels from bucket to bucket on its downward path to the car, thus eliminating all sharp impacts during loading. When the pile in the car rises to the

Fig. 19—Three-Compartment Hydro-Separator With Rewash Features



bottom of the loader, the buckets fill up, automatically stopping the flow. It may be used, according to the company, with screens or loading booms, or for loading from bins or retail pockets. Spiral lowering chutes also were featured by the company.

Treating equipment for rendering coal dustless was shown by the Coal Treating Equipment Co., Cleveland, Ohio. The No. 104 unit displayed, the company says, is capable of taking care of the production of the average sized mine. Nozzles give a very fine mist, it is claimed, under a pressure of 225 lb. per square inch. Shutting off the nozzles also causes the pump to shut down without further effort on the part of the operative. Tanks, it is said, are of the gravity-screen liquefier type, requiring no mechanical agitation.

Pumping Practices Cut Costs

Eight manufacturers exhibited pumps and auxiliary equipment at the Cincinnati exposition. The Deming Co., Salem, Ohio, showed a new 3-in., 100-g.p.m., "Oil-Rite," mine gathering pump (Fig. 23), mounted on a cast-iron sub-base equipped with wheels and axles. This unit is direct-connected to a 7½-hp. d.-c. motor with an automatic starter. In addition, the Deming company had on display a new 3-in. ball-bearing centrifugal pump (Fig. 24), direct-connected to a 1,750-r.p.m. motor; a new acid-resisting water end for the 5x5-in., 50-g.p.m., mine gathering pump, made of stainless iron, and different models of belt-driven centrifugal pumps from its regular line.

A new Yough "Liquid-Seal" centrifugal pump was exhibited by Boyts, Porter & Co., Connellsville, Pa. With this pump, the company states, the necessary sealing against atmospheric and pressure discharges is accomplished by the use of the liquid being pumped, eliminating stuffing boxes, packing, glands, wearing rings, or shaft sleeves.

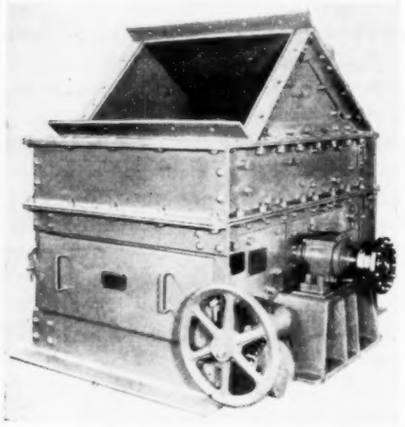


Fig. 22—M-Type "Trojan" Hammermill

Improvements in the mine gathering pumps shown by Fairbanks, Morse & Co., Chicago, are said to be as follows: distance between water end and power end has been increased, so that the pump is easier to pack and also so that that part of the rod wet in the water cylinder will not extend into the power end, thus dragging water into the oil, and valves have a driven brass seat and are without cage work which will pass small particles of coal.

The Austin-Brownie "Perfect-Oiler" mine gathering pump was shown by the Brown-Fayro Co., Johnstown, Pa. LaBour Co., Inc., Elkhart, Ind., showed a self-priming centrifugal pump and special automatic gathering valves for mine service. A standard anti-acid, self-oiling mine gathering pump was shown by the Weinman Pump Manufacturing Co., Columbus, Ohio, in addition to other types and sizes of mine pumps manufactured by this company.

An all-wood foot valve and strainer for use in acid mine water was shown by the Murray Pump & Valve Co., New Lexington, Ohio. This equipment is built with metal connections for high-pressure service and with wood connections for low-pressure use. According to the company, it may be obtained in all sizes and is everlasting. The Murray company also showed samples of scale-free pipe treated inside and outside with acid-resisting, non-corrosive paint. A lead flange is placed inside the collar between the ends of the pipe at the joints. This flange is flush with the inside of the pipe and presents a smooth surface to the flow of the water, as well as preventing seepage into the joint, with consequent destruction of the threads. Soft-rubber-lined steel pipe and hard-rubber-lined steel pipe and fittings, gate valves, and flumes were shown by the American Hard Rubber Co., New York City, in addition to solid hard-rubber pipe and fittings.

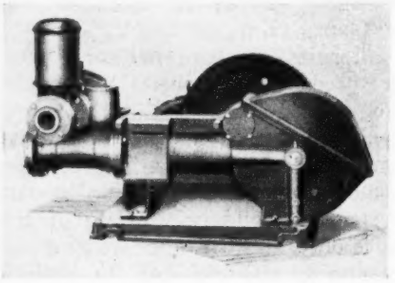
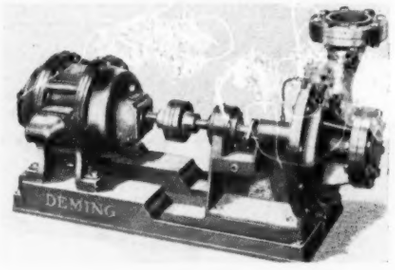


Fig. 23—Deming Double-Acting Mine Pump

Fig. 24—Deming Centrifugal Pump With Electric Drive



Economies Sought in Power Use

Material and equipment for the use and control of power was exhibited by a number of manufacturers at the Cincinnati exposition. The Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., displayed a complete, full-automatic substation, consisting of a standard, mining type, 200-kw., synchronous motor-generator set, controlled by a simplified switching outfit inclosed in a steel cubicle. High-tension equipment is mounted in the steel cubicle. A two-panel switchboard may be had for parallel operation with another source of d.c. power, and a complete set of metering equipment is included. Changes have been made in the design of the d.c. circuit interrupter which are said to greatly increase the interrupting capacity. The generator is compound wound, and a self-starting, synchronous motor is used with the set. Overspeed is controlled by a centrifugal governor. Bearing protection is provided by a new thermostatic relay.

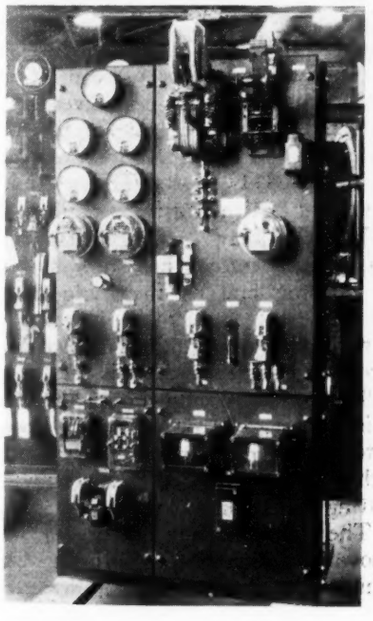
The Westinghouse company also showed a 10-hp., totally inclosed motor (Fig. 26), said to be particularly adapted for use where dust is prevalent. It is cooled by an ex-

ternal fan revolving in a space separated from the space containing the motor windings. Another item displayed by the company was a combination linestarter and disconnect switch in a dust-tight cabinet (Fig. 27). It is said to eliminate the necessity for wiring in a separate disconnect switch. Still another new item shown was an automatic transfer switch for use on cable-reel gathering locomotives. By its use the controller is automatically transferred from the trolley to the cable-reel circuit, or vice-versa, by the contact of the trolley wheel with the wire. The company also showed the new Westinghouse-Nuttall trolley, designed, it is stated, to furnish the extra current-collecting capacity required on super-powered, haulage locomotives.

New automatic switching equipment for synchronous motor-generator sets in mining service was displayed by the General Electric Co., Schenectady, N. Y. This equipment is available for sets rated at 150-300 kw., 275 volts, d.c.—2,300/4,000 volts, a.c., three-phase, 60-cycle current. Features emphasized by the company are as follows: new starting and running contactor; compact arrangement of high-tension switching equipment (Fig. 28); all connections to switchboard, which is free of high-tension equipment, made in the factory; and steel cover for high-tension wiring.

Another new development exhibited by General Electric was a 275-kw., mercury-arc rectifier for mine use (Fig. 29). This equipment offers a means of converting a.c. power to d.c. without the use of rotating machinery, eliminating, it is said, bearing troubles and commutation and installation difficulties.

Fig. 25—Switchboard for Westinghouse Automatic Substation



A new Type AX "Erico" cross bond for mine tracks was shown by the Electric Railway Improvement Co., Cleveland, Ohio, in addition to other steel and copper-weld rail bonds and welding rheostats. The new cross bond is protected against injury from derailed cars by reason of its position below the ties (Fig. 30) and the fact that only $\frac{1}{4}$ in. is exposed beyond the edge of the rail

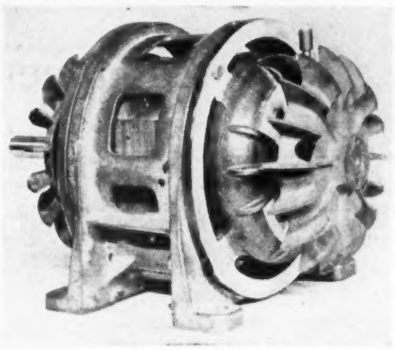


Fig. 26—Westinghouse, Type CS, Inclosed, Fan-Cooled Motor With Outer Brackets Removed

base. The Penn Machine Co., Johnstown, Pa., showed a new take-up connector (Fig. 32) for use in tightening up trolley wire over long or short spaces and a combination trolley frog and line section switch (Fig. 31), which, the maker says,

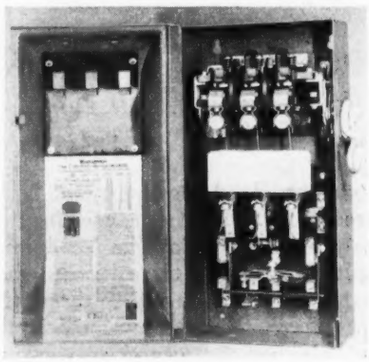


Fig. 27—Westinghouse Combination Linestarter

is easy to install and requires no hangers to hold it in position.

New equipment shown by the Electric Railway Equipment Co., Cincinnati, Ohio, was as follows: trolley frog, halfway between the straight over-run and under-run types, for large-diameter wire; adjustable current tap for use in manways or with isolated machinery; I-beam adapter for standard boss-

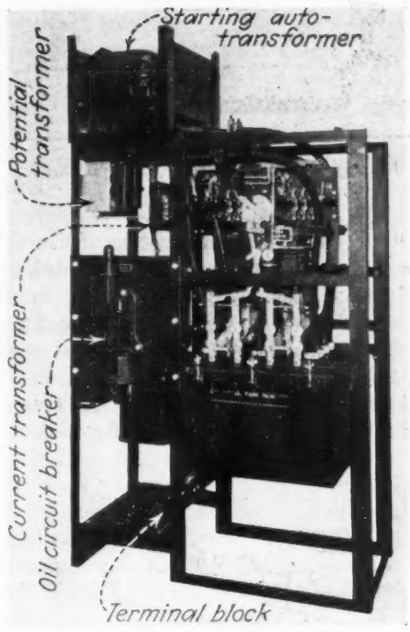
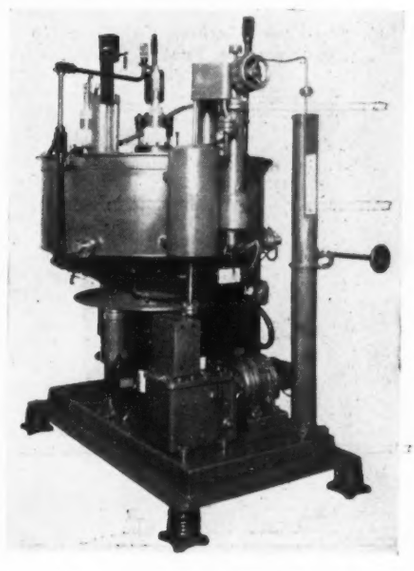


Fig. 28—General Electric Starting and Running Unit for Automatic Motor-Generator Set

type roof hangers; $\frac{3}{4}$-in. pipe extension adapter; bracket for $1\frac{1}{4}$- or $1\frac{1}{2}$-in. pipe, made in two halves to fit uneven roof or sidewalls; 6-0, straight-through, trolley wire splicer for either figure 8 or grooved wire, and a combination trolley and cable clamp for carrying 500,000 to 1,500,000-circ.mil feeders on one side and trolley wire on the other.

Plugs and receptacles for mine use were exhibited by the Albert & J. M. Anderson Mfg. Co., Boston, Mass., in addition to a line of trolley material. Automatic compensator starters were shown by the Electric Controller & Mfg. Co., Cleveland,

Fig. 29—General Electric Mercury-Arc Rectifier



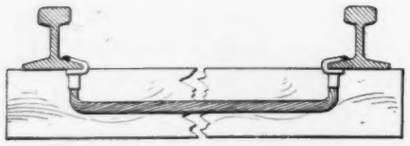


Fig. 30—"Erico" Type AX Cross Bond

Ohio. Ball-bearing motors formed part of the display of Fairbanks, Morse & Co., Chicago. Line material and other specialties were exhibited also by the Flood City Brass & Electric Co., Johnstown, Pa.; Rome Wire Co., Rome, N. Y.; General Electric Co., Schenectady, N. Y.;

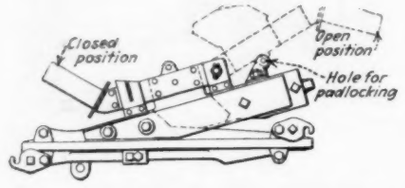
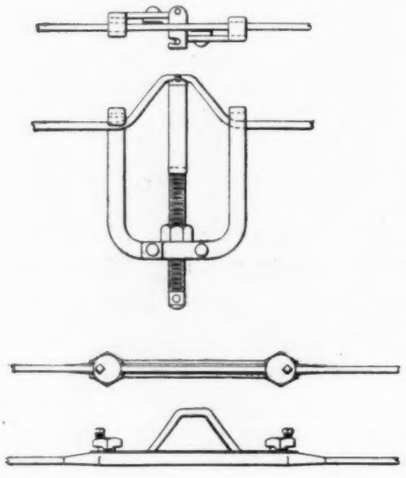


Fig. 31—Penn Machine Co. Combination Trolley Frog and Line Section Switch

Simplex Wire & Cable Co., Boston, Mass., Ohio Brass Co., Mansfield, Ohio; American Steel & Wire Co., Pittsburgh, Pa.; and the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. The National Armature & Electric Works, Bluefield, W. Va., featured its armature winding and repair service. Storage batteries were displayed by the Edison Storage Battery Co., Orange, N. J., and the Electric Storage Battery Co. Philadelphia, Pa.

Type E, "explosion-proof," self-ventilated, ball-bearing, squirrel-cage motors were offered for use in gaseous or dusty atmospheres by the Louis Allis Co., Milwaukee, Wis.

Fig. 32—Penn Machine Co. Take-Up Connector for Trolley Wire



Features of these machines, which are available in sizes from ¼ to 75 hp., are outlined by the company as follows: mounting dimensions are the same as standard motors; weight is only 15 per cent greater; and they are interchangeable in practically all sizes with standard L. A. motors.

In addition to steel-grid resistances for mine use, the Post-Glover Electric Co., Cincinnati, Ohio, offered for inspection a new automatic transfer switch for use on mine locomotives. It consists of a rocker arm controlled by two magnets, so arranged as to switch the controller from the trolley circuit to the cable-reel circuit, or vice versa, by placing the trolley in contact with the wire or removing it from it.

A new brush material—No. 869—was shown by the National Carbon Co,. Cleveland, Ohio, for use on mine locomotive and mining-machine motors. It is claimed that its carrying capacity, sturdiness, and mild abrasive action contribute to satisfactory commutator conditions over extended operating periods in heavy-duty service.

Safety Equipment Reduces Injuries

Safety devices for the use of the coal industry were among the most important items exhibited at the Cincinnati exposition. The new Edison Model H electric safety cap lamp was one of the features of the display of the Mine Safety Appliances Co.,

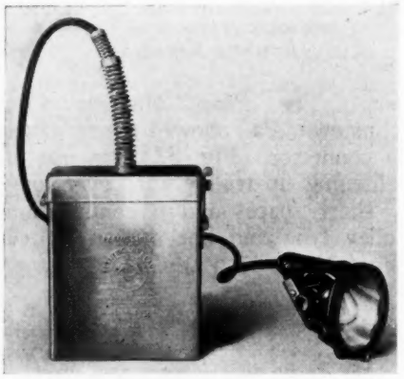


Fig. 33—Edison Model H Electric Safety Cap Lamp

Pittsburgh, Pa. Approved by the U. S. Bureau of Mines, it consists of a newly developed Bakelite headpiece, employing a single, two-filament, gas-filled bulb, which is said to direct the light where it can be most efficiently used whether the wearer is working or traveling. The lamp is illustrated in Fig. 33. The company also displayed new fireproof charging racks for use with these lamps.

Other new items of equipment displayed consisted of the M-S-A safety lamp emergency kit (Fig. 34) containing twelve permissible Wolf lamps and accessories arranged in a fiber case; the M-S-A portable searchlight, said to furnish a strong beam of light reaching a thousand feet, and to be particularly advantageous in lining up track and other underground work; and the Crowe safety saw. In addition, the company displayed items from its line of first-aid and mine safety equipment.

Wheat "Super-Ex" electric cap lamps were shown by the Portable Lamp & Equipment Co., Pittsburgh, Pa., which also offered for inspection a charging rack. Flashlights, portable floodlights, shotfiring equipment, and "Sunshine" health lamps were shown by the National Carbon Co., Cleveland. First-aid material was demonstrated by the Max Wocher & Son Co., Cincinnati, Ohio.

A high-pressure rock-dust distributor (Fig. 35), said to be designed especially for rock-dusting back areas and capable of delivering dust through 500 ft. of hose was shown by the American Mine Door Co., Canton, Ohio. Dimensions are as follows: over-all length, 13½ ft.; width at the top, 5 ft.; and height above rail, 37 in. A conveyor valve in the housing is synchronized with the agitator shaft so that the dust is fed and discharged in a continuous stream. Controls, it is said, may be conveniently operated from either side of the machine. The Mine Door Company also showed its Electri-Throw equipment for controlling mine haulage.

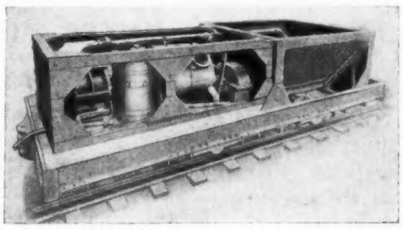
Paul R. Hay & Co., Pittsburgh, Pa., demonstrated their new system of opening and closing mine doors by train control. By the operation of a reversible motor, limit switch and two contactors, the door is automatically opened to allow trips or machinery to go through and is closed afterward, being brought to rest in either position by the predetermined setting of the limit switch.

The new Cardox cartridge was shown by the Safety Mining Co., Chicago. This equipment was de-

Fig. 34—M-S-A Safety Lamp Emergency Kit

scribed in *Coal Age*, November, 1929, page 720. Explosives and blasting supplies were featured by the Atlas Powder Co., Cleveland, Ohio; E. I. duPont de Nemours & Co., and the Hercules Powder Co., both of Wilmington, Del. Ventilating equipment was shown by the Robinson Ventilating Co., Zelienople, Ohio, and the Jeffrey Manufacturing Co., Columbus, Ohio.

Fig. 35—American Mine Door High-Pressure Rockduster



Industry Offers Coal-Mining Aids

Aside from the manufacturers who exhibited equipment used directly in the mining and preparation of coal, other industries which contribute to coal mining also exhibited material of interest at the Cincinnati exposition. The Lincoln Steel & Forge Co., St. Louis, Mo., displayed the EM200 electric greasing machine, the largest of its new line. This equipment is illustrated in Fig. 36. The company asserts that it will pump 4 to 5 lb. of grease per minute against any pressure from 600 to 1,200 lb. per square inch. No air pressure is required or used and the machine is a self-contained unit. The Lincoln Company also showed its new standard grease plug for mine cars and the new-type standard nozzle.

Oils and lubricants were shown by the Hulburt Oil & Grease Co., Philadelphia, Pa.; Keystone Lubricating Co., Philadelphia, Pa.; Pure Oil Co., Columbus, Ohio; and the Waverly Oil Works, Pittsburgh, Pa. Fishoilene Sales, Inc., Pittsburgh, Pa., demonstrated its rust-preventing oil for use on screens, machinery, and other metal work.

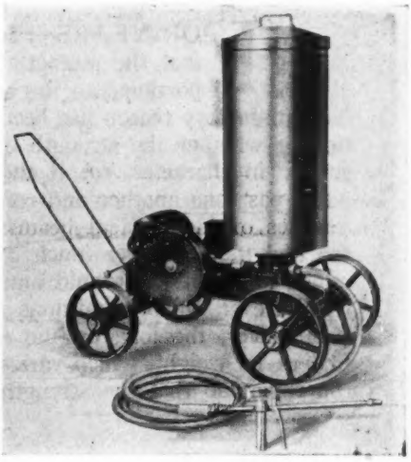
Wire rope for mine use was shown by the American Cable Co., New York City; American Steel & Wire Co., Chicago; Hazard Wire Rope Co., Wilkes-Barre, Pa.; A. Leschen & Sons Rope Co., St. Louis, Mo.; John A. Roebling's Sons Co., Trenton, N. J.; Rome Wire Co., Rome, N. Y.; and the MacWhyte Co., Kenosha, Wis. Bearings were shown by the Ahlberg Bearing Co., Chicago; Norma-Hoffman Bearings Corporation, Stamford, Conn.; S.K.F. Industries, Inc., New York City; Timken Roller Bearing Co., Canton, Ohio; and the Bertrand P. Tracy Co., Pittsburgh, Pa. Gears, speed reducers, and equipment for the mechanical transmission of power were displayed by the Link-Belt Co., Chicago; Morse Chain Co., Ithaca, N. Y.; Tool Steel Gear & Pinion Co., Cincinnati, Ohio; and the Penn Machine Co., Johnstown, Pa. The Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., showed a new-type Westinghouse-Nuttall, horizontal-design, speed reducer, equipped with single helical gears and anti-friction bearings. They are made in both single and double reductions, and include a total of 24 sizes and 28 standard ratios from 2.82 to 1 to 70.8 to 1 in capacities up to 635 hp. Joseph T. Ryerson & Son, Inc., Chicago, offered for inspection alloy, stainless, and tool steels applicable to the mining industry, as well as the special Glyco bearing metal.

The Mt. Vernon Car Mfg. Co., Mt. Vernon, Ill., called attention to a new greasing equipment designed, it is said, especially for Joy loading machines, high-pressure Alemite systems, or other high-pressure greasing systems. It consists of two tanks to be mounted on a mine car, one carrying heavy oil for transmission and gear cases and the other red oil for use where needed. Tanks are fitted with a motor, air compressor, pressure regulator, and a flow meter. The machine may be obtained either with or without self-propelling equipment.

As a part of its general line, a new, single-acting, automatic lowering jack for mine work—No. 67-A—was shown by the Joyce-Cridland Co., Dayton, Ohio. High capacity and light weight are features stressed by the company. The No. 67-A trip jack is equipped with a combination automatic lowering and trip arrangement, allowing the jack to be tripped only when not supporting a load. Five tons is given as the capacity of the equipment. Templeton, Kenly & Co., Chicago, displayed items from their full line of jacks for mine and industrial use.

Wood preservation was demonstrated at the booth of the Century Wood Preserving Co., Pittsburgh, Pa. Steel timber sets were shown by the Carnegie Steel Co., Pittsburgh, Pa. The Osborne Register Co., Cincinnati, Ohio, demonstrated its scrip-issuing machines. The Snap-On Wrench Co., Chicago, displayed its line of industrial wrenches.

Fig. 36—EM200 Lincoln Electric Lubricator



COAL AGE

SYDNEY A. HALE, *Editor*

NEW YORK, MAY, 1930

What next? This is next

ROOF SUPPORT is the big problem of coal mining. It seems to be getting even more attention in Great Britain than mechanization and in some mines it is about as fundamental, for it determines the type of mechanization used and the method of working adopted. If a mechanical loading layout involves the use of too expensive a method of timbering, then it fails to be successful, and a different—and usually a less desirable—layout and semi-mechanical equipment or equipment of smaller capacity has to be introduced. Consequently, roof support is a major problem. Concentration, supervision, efficiency, safety all depend on it, yet little is being done in the United States to obtain the necessary experience or make the needed researches.

A large percentage of accidents arises from inadequate timbering methods and lack of concentration. The introduction of better means of supporting, preserving, and bringing down roof is a vital need. All the Bureau of Mines studies visualize wood as the material to be used. It is time that the steel post, the steel timber, and the steel arch received consideration. The advantage of the steel post is that, when properly constructed, it can be collapsed from a distance and with entire safety. Post drawing becomes a job without hazard. Falls can be made to follow a mathematical line. Faces are not lost or the men working on them jeopardized. When stee. timber is general, safety will be inherent in face methods, not the outcome of an elaborately inculcated gospel to be taught and taught and taught again.

Greater depth, more strength

FOR YEARS it has been recognized that the strength of a beam is proportional to the square of its depth. No satisfactory reason has been deduced for questioning whether the strength of the mine roof is similar in character, for if the measures tried to move past one another and convert the beam into a series of independent beams the fact that they are tied together over much of the coal territory mined and unmined would limit that slippage materially even where conditions favored it.

However, the load on the mine roof is solely that of its weight, which varies with the depth of the cover, so that the strength of the mine roof must be, according to the beam theory, directly proportional to the depth. Shallow roof is dangerous, not only because of lack of beam depth but because of the rottenness of the rock and the large proportion which the loose overburden bears to the whole roof cross-section. Deep roof sometimes is dangerous, because the limestones in it have been preserved by the absence of air and moisture, so that when these factors are admitted the roof begins at once to expand and soften. These, however, are inherent, not structural, weaknesses. A thick roof is structurally strong, and such a roof should stand over larger spans than when the roof is thin. Every one recognizes that a thick roof is broken with difficulty for this very reason. All of which does not assert that the vertical pressures will not be increased proportionately with depth.

Entry vs. heading

AMONG the mining terms paired up by synonymous usage, no two cause more confusion and awkwardness in expression than "entry" and "heading." They are used interchangeably, sometimes to designate but one haulage, airway, or manway opening; sometimes to define a system of such openings. For the sake of clearness, it seems logical that each of these words should be given one definite meaning.

Because "entry" is the more often used to represent two or more of these openings as a system, and because it conveys accurately this particular meaning, why not confine the word to this usage? That choice would leave "heading" as the expression of a single opening. Then, one could say or write, "the main entry is on a five-heading system," or "the main entry is composed of five headings." Inasmuch as these two terms enter into practically all discussions of mine layout, the differentiation would eliminate much misunderstanding.

Transportation engineering

WITH underground haulage graduated into a real transportation system, the advantages of greater functionalization and sharper division of authority become more apparent. As mine transportation systems have grown in size and speed, keen management has looked to railroad practice for inspiration and suggestion. Dispatching has become common in modern mines; heavier rail and bigger rolling stock have entered the picture. In relatively only a few cases, however, has recognition been given to the separation between operating and maintenance functions.

Track design, construction and maintenance are functions apart from haulage and should be segregated from the responsibility for actual operation. These undertakings lie within the field of the trans-

portation engineer as surely as haulage lies within the field of the operating officials. Experience has shown the need for the division of responsibility, but few producers have been disposed to acknowledge that need by making an adequate division of authority.

As the master mind of trip dispatching, the mine boss has shown genuine ability. But, as a builder and a caretaker of track, he has displayed little skill. He has failed in the one job only because he lacks intimate knowledge of transportation engineering and the time to apply it. Long ago railroads parceled out responsibility for maintenance of track to one group and for operation of trains to another. Coal companies would gain by patterning after the common carriers.

"I command"

"NOT a loader—a machine operator." That answer, made by a workman in the pride of his newly acquired status, may well contain the answer to the growing question of man-power for the coal mines. Aside from reduction in costs and lightening of the burden of the employee, is the problem of holding the worker's interest. Is the miner more likely to remain in the mines when he must depend upon his own muscle to heave coal into a mine car, or when he feels the thrill of power which results from mastery over a machine—a machine which takes over the drudgery of his task?

Sociologists and personnel workers recognize that a large part of the difference between grudging subservience and enlightened effort willingly given lies in the power of the worker to direct, even if it be only the movements of a machine. Loyalty to the coal industry, which gives the miner his livelihood, can easily be one of the principal benefits of mechanization.

The widening ripple

ILLINOIS and Indiana operators, retail distributors, large industrial consumers in the two states, and manufacturers of heating equipment met at Purdue University last month in the first of a series of annual Midwest Bituminous Coal Conferences. Such meetings of all parties of interest to discuss common fuel problems cannot but result in good. There are two aspects of the situation, however, which have a deeper significance than this manifestation of a co-operative spirit between producer, distributor, and consumer. First in importance is the fact that operators of two closely competing states are working together on what is essentially a sales problem. Second is the recognition of the mutuality of interest of producer, retailer, and equipment manufacturer.

Indiana coal men, in co-operation with the university, launched a state fuel conference three years ago. Illinois, seeing the good work under way, might have sought to stage a similar, unallied meeting. But the men guiding coal-trade destinies in the two states took a broader view. They joined forces in a practical demonstration of intertrade activity heretofore too often confined to vocal professions. Is it unreasonable to suppose that the circle of co-operation will widen as time goes on and embrace still other fields in a practical consideration of day-to-day merchandising and service problems?

Bringing the manufacturer more sharply into the picture means a more intelligent and constructive approach to the competitive situation in the domestic fuel market. The future of coal's hold upon that market is intimately tied up with the question of the fuel-burning equipment which is to go into the home. When, as one heating contractor stated at Purdue, his company had not installed a coal plant in a new residence in three years, the necessity for co-operation such as the Purdue conference and the recent meeting between equipment men and a committee of the National Coal Association at Chicago stimulate is self-evident. Both the industry and the manufacturers will profit by working together; both, by so doing, will avoid costly mistakes.

Job analysis

IN FACTORY PROCESSES which are favored by a fine division of labor in highly repetitive jobs man training has shown orderly progress. But the physical and the intuitive eyes of the basic industries so far have failed to visualize tangible assets for the promotion of clean-cut, co-ordinated principles applicable to the training of the individual worker. Certainly, little advance has been made along such lines in coal mining, perhaps because mine operation is still largely a succession of jobs that are not highly specialized.

Mechanization puts a premium on the specialized worker and makes his training imperative. But an open mind is a prerequisite to results. It should not be argued that the problem deals with so many vagaries and variations on the human side as to defeat solution by definite planning. As has foreman training, man training can be crystallized into fairly distinct methods.

How man training can be crystallized into fairly distinct methods by job analysis is suggested by William Moorehead, superintendent, Phelps Dodge Corporation, Dawson, N. M. His remarks, contributed to "The Bosses Talk It Over," appear on page 319 of this issue of *Coal Age*. Job analysis should open the gate to a field fertile with ideas. It separates principles from details and puts them into forms that are readily seen by the eye and grasped by the mind. It imparts straight thinking to those intrusted with the training of workers. Labor will appreciate the logic of this instructional thinking.

THE BOSSES TALK IT OVER

Labor Turnover— How Can It Be Minimized?

"HIGH labor turnover seems to be our weakness now," said Jim to Mac, as they sat, elbows touching, while scanning the payroll sheets in the super's office. "These sheets look like a hotel register to me. We have too many men here today and gone tomorrow."

"Don't I know it?" countered Foreman Mac. "That's the whole answer to our troubles—mounting costs, more accidents, lower tonnage, and less production per man. Those newcomers are mostly all tramp miners. They are shiftless and unreliable, they look ahead only to the day when they'll have enough money to pull out again. What's more, they are driving our good people away."

"You've stated the case all right," added Jim; "but it's the answer we are looking for. It's no easy job we're up against. You and I are to blame, I guess, for hiring them."

"Yes and no," shot back Mac. "We need miners, and those tramps make up most of the men applying for jobs. The Old Man is in the picture, too. It's now costing us 12c. more to produce a ton of coal than it did two years ago. If an investment equal to half that sum per ton had been made in giving our good men what they want and need, I'll bet our cost would be 20c. lower instead of 12c. higher. Am I right or wrong, Jim?"

WHAT HAVE YOU TO SAY?

1. *What specific steps do you take to keep your men and their families satisfied?*
2. *How do you play up to and treat the promising newcomer?*
3. *How do you spot and handle the tramp miner?*
4. *Should tonnage be curtailed when good workers are scarce?*
5. *When, if ever, is it permissible to hire transient miners?*

All superintendents, foremen, electrical and mechanical men are urged to discuss the questions on page 318. Acceptable letters will be paid for ▶▶▶▶

How would you go about training mine foremen in their every-day job to meet production changes? The Old Man assigned that problem to Mac and Jim in April. How the readers of *Coal Age* would solve this problem is told in the letters following.

Provide Technical Literature For the Foreman in Training

THIS is an old question that ought to produce modern views in the discussion. Foremen, and in fact some of their superiors, should always be in training, theoretically as well as practically. Practical experience can be acquired only by getting in harness and pulling the plant up to a standard laid out by those in control. The man in harness must be backed to the limit with co-operation and equipment. When he reports a situation in human relations or material conditions that requires a decision which he feels is outside his authority to change or correct, ask him how he would decide it. If you can't agree with him, explain your reasons. This is practical training. Job processing cannot be accomplished by a course on the subject. Only the ends are best gathered up by round-table meetings of the different bosses, including those with the authority to make changes where suggested.

Most important of all in the training of foremen, equip them with thorough knowledge of how other organizations are functioning. Place in their hands all worth-while technical data and publications bearing upon their field of work. Jim has the right idea; job study should be done on the job and the loose ends, or reading, absorption of details and analyzing, should come during off hours.

Chas. H. Willey,
Assistant Plant Superintendent,
Hoyt Electrical Works.
Penacook, N. H.

Why Not Apply Some System To Hand-Loading Methods?

OF COURSE, bosses need training on a new job. How else would they be prepared to train workers? They not only need training in the theory of the new work but they need it in the practical end, so that they can show by actual performance that they know what they are doing and gain the confidence of the workmen. To have a good cost per ton, the boss must know how to operate a machine and keep it going. He must know how to select the right man for the right job; how to arrange the work to create the least amount of friction.

In room-and-pillar work he can accomplish much by laying switches in the breakthroughs at intervals, and take the coal from three or four room faces over one room switch. Thereby a number of room switches will be eliminated and derailments avoided. Any extra cost that would be incurred in trackwork should be more than repaid in the saving of car changes and in the saving of materials. In mining in a panel layout, a knowledge of the character of the roof should govern the advance of development, also the number of rooms to be allotted to the machines. Where entries can be driven to their limit before the rooms are worked, start rooms on the inside end and mine the room in sets progressively outby, leaving breaker pillars between sets. A greater recovery of coal can thus be obtained with a higher degree of safety and at lower cost.

Practical training of all bosses is essential, for upon them depends the success of any mechanical loading operation. When the machinery stops during the working shift the workmen's time goes on and the company is the loser. If the boss is a trained man, he knows what to do, how to do it, and can eliminate much loss of time by the application of his knowledge. J.A.R.
Sullivan, Ind.

On Organization

Labor turnover! What worries and tribulations are called up by the mere mention of this problem. It has been rife with grave consequence; it is synonymous with shortage of men—good men; and in large part it is due to faults in management.

What has been your experience in matters pertaining to labor turnover? How do you go about building up a permanent organization? Particularly, how do you spot the ne'er-do-well occasional miner? Your experience in this troublesome problem is needed to make the discussion complete. Send in your letter today.

Job Analysis Means Much To Management and Men

YES, I do approve of the Old Man's stand. Naturally, one may ask what is to be gained by job analysis and a study of common practices? The answer is divided as follows:

For the management:

1. It uncovers bad practices, so that they may be corrected.
2. It locates good practices, so that they may be more generally used.
3. It tends to standardize practices and simplifies supervision.
4. It defines responsibility and tends to eliminate misunderstanding.
5. It discloses opportunities for organized training and improvement.
6. It develops an analytical ability in those who participate in making the job analyses, and this enables them to meet new problems in an effective way.

For the foreman:

1. It brings out the more instructional material to be used in training new workers.
2. It serves, in written form, as instruction sheets for use of both new and old workers.
3. It decreases accidents by elimination of poor practices.
4. It backs the foremen up in getting things done right.

To the individual worker, who profits by development of standard practices, it gives:

1. Safer ways of working.
2. Faster ways of working; hence, more pay to the worker.
3. Easier ways of doing jobs.
4. It helps to avoid unpleasant controversies with foremen and others by establishing the way jobs should be done.
5. It helps toward congenial co-operation between partners.

Making a job analysis is distinctly a beneficial activity for any administrator. The benefits are in the mental balancing and evaluations made in trying to develop a complete and consistent analysis. To secure these invaluable benefits it is necessary for each group actually to do the work of making the analysis. It is evident that if the foremen make a job analysis and agree upon what should be the accepted way of doing each operation, they will be putting their stamp of approval upon instructional material based on these practices. Further advantages are the improvements, or possibilities, that naturally present themselves to the foremen as they think through each step of the operations they supervise.

Several months ago the bosses of the Stag Canon Branch of the Phelps Dodge Corporation, Dawson, N. M., directed by the State Supervisors of Trade and Industrial Education for

New Mexico and Colorado, made a job analysis of common coal-mining practices. They met in a room provided with a large blackboard. A list of payroll jobs was made, including miner, loader, timberman, motorman, nipper, trackman, wireman and pumpman. Each of these payroll jobs was then broken up into a series of work jobs. A work job was analyzed under the following headings: Job; operations; how to do operations; special information.

WILLIAM MOOREHEAD.

Dawson, N. M.

The Know-It-All Is Costly Addition to Company Payroll

THE OLD MAN said a mouthful when he decided that bosses need training in order to train workers. In too many instances bosses are insisting on men doing some things in and around the mines in some particular way, when the worker knows before the job is started that the suggested method is not workable. The foreman wants to appear to know all about the job; he isn't open to any suggestions from any man under him, and the company is the loser, because it pays for a job that is not at all satisfactory when completed. A man who is in charge of men should familiarize himself with the work he expects them to do before he gives orders. Otherwise, he can be no judge of the quality of the job.

The know-it-all is a costly addition to the payroll of any company. It is easy to give orders to men and see that they are carried out, but that does not necessarily mean that the reasoning behind the orders will meet the test. The foreman who does not put a new job squarely up to his workers, even though he has settled many of the details in his own mind, is not a good foreman. The humble worker generally has ideas and suggestions which, if followed, may completely change the initial plan. Any man who thinks he is always right, is generally wrong 90 per cent of the time. That is why I think the company should insist upon its foremen familiarizing themselves with their working conditions and details of methods in the plant.

The trainer of men should be asked to show his knowledge of the jobs he intends to teach. It is a dangerous business to allow a man to act as teacher if he is not familiar with what he teaches. It is like taking a sheep herder for a lion trainer, just because he is a good whistler. He would perhaps know that nature of the sheep, but he would not know the lion.

Mac, in his position, should have known that brushing up on mathematics and chemistry may help him, but will not directly contribute to the Old Man's cause. A foreman is paid for knowing how to get the coal out economically, and not for his knowledge of mathematics and chemistry.

Pierce, W. V. HOWARD LONG.

Theory Must Come First

HISTORY has been defined as a collection of myths agreed upon. Documentary evidence may be unearthed; proof offered beyond cavil may be entered in the "dope" book; learned investigators may weigh and come to judgment; yet the majority of humans will adhere to the pretty fables in spite of disturbing facts.

Authoritative publications give space unstintedly to a successful operation, and around the ornate pictures of the dignified heads of such a concern one can fairly visualize a halo of fame. And yet, these imposing personages will be but remotely connected with the operation in question, and may be utterly indifferent to the method applied that yields such happy results. This is not a facetious assertion, but can be borne out in a hundred different activities in the immediate past and the present generations.

Mine foremen seldom reap notoriety when the band is playing, though they and their assistants invariably carry the heavy end of the load and have to apply in practice that which the technicians and theorists have solved to their own satisfaction. There is a distinct disadvantage in this, for little or no allowance is made for the abnormalities that are a commonplace in mining experience. A mine fan will deliver so many thousands of cubic feet of air so many miles underground at a given water gage with a certain horsepower motor. We know it can be done, for we have the proof in elaborate calculations based on fundamental ventilation formulas.

The mine foreman is given the development to carry out on a cost plus basis, and for a while all is rosy. A few doors may have to be erected that cannot be made quite airtight, and a certain short circuit of air is to be expected here. After the mine is developed a mile or so, the roof in the aircourse will begin to break, either through rotting timbers or a weakness in the strata overhead, causing a serious obstruction in the main airway.

The mine foreman is here confronted with the problem of running up the cost of operation in clearing away this obstruction. If he makes a half-hearted effort to level off the fall, he merely throws a larger load on the fan motor and raises the power cost, which will have to be pared elsewhere, or risk a thunderbolt from headquarters. The mine foreman isn't any too well versed in the fundamentals of mine ventilation anyway, his failure to get an anemometer reading being the first indication that something is wrong. Here we have two evils: too much theory and too little practical experience in both instances.

Political maneuvering has too long been the measuring stick of the average mine foreman's worth, and too much has been left to the theorist. There is a disturbing and, in many cases, a disastrous lack of harmony between these two potent forces. Too much has been left to outside agencies in preparing men for these important positions, and much too little to the coal corporations in the success of whose operations these men play such a vital part.

Coal mining today is an intricate and highly technical calling attended by grave dangers and undoubted difficulties. Politics should not be allowed to inter-

Publications Received

The Future Movement of Iron Ore and Coal in Relation to the St. Lawrence Waterway, by Fayette S. Warner. University of Pennsylvania Press, Philadelphia, Pa. Pp. 195, illustrated. Price, $3.

Practical Application and Cost of Proper Rock-Dusting, by G. M. Kintz, Bureau of Mines, Washington, D. C. I.C. 6,244; 7 pp. Covers methods and cost of dusting at the Swastika mine of the St. Louis, Rocky Mountain & Pacific Co., of Raton, N. M.

Coke-Oven Accidents in the United States During 1928, by W. W. Adams and L. Chenoweth. Bureau of Mines. Price, 10c.

How Leakage of Current From an Electric Shotfiring Circuit Causes Misfires, by L. C. Ilsley, A. B. Hooker, and D. H. Zellers. Bureau of Mines, Washington, D. C. Technical Paper 471; 16 pp., illustrated. Price, 5c. Covers tests made at the Pittsburgh Experiment Station of the Bureau of Mines.

Diamond Core Drill Fittings. Bureau of Standards, Washington, D. C. CS17-30; 15 pp., illustrated. Price, 10c. Contains specifications adopted at a joint conference of manufacturers, drilling contractors, and general interests.

Recent Patents

Miner's Safety Lamp Attaching Means; 1,746,113. John Giacomini, Rains, Utah. Feb. 4, 1930.

Material-Handling Plant; 1,746,359. Glen O. Morford, Berwyn, Ill., assignor to Roberts & Schaefer Co., Chicago. Feb. 11, 1930.

Mine-Gas Detector; 1,746,425. Ernst Heckert, Kiel, Germany. Feb. 11, 1930.

Cleaning Device for Coal Breakers; 1,746,555. John A. Plimpton, Winnetka, Ill., assignor to Pennsylvania Crusher Co., New York City. Feb. 11, 1930.

Hydraulic Coal and Ore Washing and Separating Machine; 1,746,557. Charles F. Richards, White Haven, Pa. Feb. 11, 1930.

Flotation Apparatus; 1,756,682. Joseph P. Ruth, Jr., Denver, Colo. Feb. 11, 1930.

Coal-Handling Plant; 1,746,743. Clyde P. Ross, Chicago. Feb. 11, 1930.

Post-Pulling Device; 1,746,920. Albert S. Yencha and John A. Forish, Unity Township, Pa. Feb. 11, 1930.

Mining Machine; 1,747,196. Frederick W. Vodoz, Wilmettem, Ill., assignor to Goodman Mfg. Co., Chicago. Feb. 18, 1930.

Process of Carbonizing and Distilling Carbonaceous Materials Such as Lignite, Coal, Wood, Peat, etc.; 1,747,731. Wm. W. Odell, Pittsburgh, Pa., assignor to Glenn W. Traer, Jr., Minneapolis, Minn. Feb. 18, 1930.

Flotation Apparatus; 1,748,107. Wm. A. Butchart, Joplin, Mo. Feb. 25, 1930.

Mine Car; 1,748,118. Harry P. Field, Berwick, Pa., assignor to American Car & Foundry Co., New York City. Feb. 25, 1930.

fere in so critical an affair. It behooves the coal corporations to arrange an absolute divorce by making a forthright stand in the matter. It is not enough to allow a state department to be the arbiter on any mining man's qualifications.

Coal corporations should maintain a technical training staff of their own, and insist that all candidates for official positions be trained and tested by that medium first. Headed by a man of integrity who is untrammeled in the performance of his duties, the effect would be far-reaching and effective. The reputation itself would command respect, and the personnel of the mine workers would follow intuitively any suggestion given by one with such a training, which is more than the present system can boast of. The teaching staff would be thoroughly up to date and alert in coping with and anticipating improvements and innovations.

After a thorough training course in the theory of mining in all its phases, a practical application of this training is next indicated. The candidate would then be required to spend a few years, proportionately, as a mine examiner, to become familiar with the various instruments used in testing ventilation; as a timberman, to learn the best application of roof supports; as a tracklayer, to apply the theory of railroading; as one of the crew of a loading machine, to do himself that which he expects others to perform.

As it requires about five years to make an efficient room-boss, this term of training serves as an excellent finishing school wherein proficiency in the art of handling men, among other things, would be taught. Then, if you apply a seniority system in filling the more responsible positions, you have an organization that will inspire respect and give instant response. Nepotism would thus receive little encouragement and the political hucksters would have to dig a little deeper than into the good graces of a ward heeler. There can be no doubt that the present system of placing men in the most responsible positions in mining is decidedly ragged.

The Old Man is half right. Let him go through with his practical training for foremen *after* he has been assured of their theoretical accomplishments. Only after rigorous training should those who follow our hazardous vocation be established in honored positions.

Panama, Ill. ALEXANDER BENNETT.

Surprising Results Obtained By Daily Analysis of Job

THE OLD MAN is right; assistant bosses need a general brushing up at least once every two weeks. Why not spend a few minutes each day, after your work is done and you have rested, figuring out ways and means of effecting economies? I have added six to ten tons of coal a day to the output of our mine by suggesting that refuse which accumulates and sticks to the bottom of mine cars be removed periodically.

Any man can spend money, but it takes a lot of figuring to save it. No better suggestion can be made than that the bosses meet every two weeks prepared to discuss operating problems. During the interval between meetings, each man should gather information and ideas and be ready to lay them on the table at the conference.

Stickney, W. Va. F. J. HALL.

❖

Further Views of Readers On Clean Coal

Letters on the problem of cleaning coal at the face, stated in the March issue, continue to come in. The last of these appear below.

Coal Preparation Must Begin At the Mine Working Face

THE getting of too much ash in the coal is many times due to poor selection of the cutting horizon, slipshod cutting methods, or improper handling of the refuse at the working face. It is at the working face that the first steps should be taken to eliminate impurities derivable from the methods followed in mining.

It is quite necessary that some means be developed at the mine plant to determine the origin of impurities arriving with coal at the preparation plant for treatment. The system should embrace physical and chemical examinations of coal as found at the working face. Certain places produce more refuse than others, and in these cases the cause should be sought. With complete information at hand concerning the degree of purity or impurity of the coal mined from various sections and places, the management is in a position to supervise intelligently the changes that are necessary in face preparation. W. E. WARNER.

London, England.

Pity the Poor Inspector

THE CLEANING of coal at the working face is vital to the prosperity of the company. It is a problem that cannot be solved merely by telling the boss to do it. The job takes close supervision. Sometimes persuasion will not cause men to clean the coal as it is being loaded. In cases of this kind the inspectors should have authority to dismiss the guilty party through the mine foreman. The inspector could be the court of last appeal. The big difficulty is that the man who loads the biggest tonnage is looked up to by the mine management, even though he is the greatest offender against the rules requiring the loading of clean coal.

The part that is hard to understand is that a man who pays his debts, and who will not steal, will load out all the refuse he can conveniently reach in his working place. He, too, is the loudest kicker in controversies over the accuracy of the yardage measurements.

Of all the company representatives at a mine plant, the inspector has the hardest job. The miners don't like him; shotfirers, and even the foremen, are not likely to report violation of clean-coal rules for fear of being called a "snitcher." It is because of this lack of co-operation that the inspector's job is difficult.

It takes hard and fast rules to get clean coal. These rules must be made to apply to all men alike, and they must be enforced at all costs by officials who are square and not afraid. If the inspector cannot get the full backing of the plant officials, his efforts are useless.

I have seen no better system for getting clean coal than that of requiring an inspection of the coal face before it is shot. A record should be kept of the mine cars distributing coal to each railroad car, so that in case of a complaint the management will know where impurities originated. This has been proved to be a practical method of curbing careless loading.

C. E. MONTGOMERY.

Edwight, W. Va.

A Clean Product Is a Matter Of Disciplining the Miner

IN ORDER to get coal as clean as possible from the mine, the foreman must be charged with the responsibility of visiting working places regularly with the problem uppermost in mind. The miner, through force of habit dating back to earlier years, is interested only in loading out tonnage. He gives little thought to quality unless rigid discipline is applied. Individual cars of coal should be examined at odd periods to detect the miners who habitually load out unnecessary quantities of refuse. These men must be penalized or else discharged, if rigid control of quality is to be effective.

The problem cannot be solved by putting a company man to work in a place removing slate and other impurities after the coal is shot down. Responsibility for the quality of coal should be placed directly on the shoulders of the miner. Much refuse gets into the coal only because the place is not properly cleaned up before a cut is blasted. If the foremen arrange to visit these places before they are blasted, they will find the men responsible for this bad practice. Soon, the word will spread throughout the mine that the management is on to the game.

FREDERICK NEUMAN.

Scranton, Pa.

OPERATING IDEAS

From PRODUCTION, ELECTRICAL And MECHANICAL MEN

This Two-Way Signaling System Requires Few Wires

AN example of an elaborate but simple two-way signal system for communication between the mine dump and the tipple and cleaning plant is that in use at Wildwood mine of the Butler Consolidated Coal Co., Wildwood, Pa. The rotary dump is located in the mine at the bottom of a belt-conveyor haulage slope.

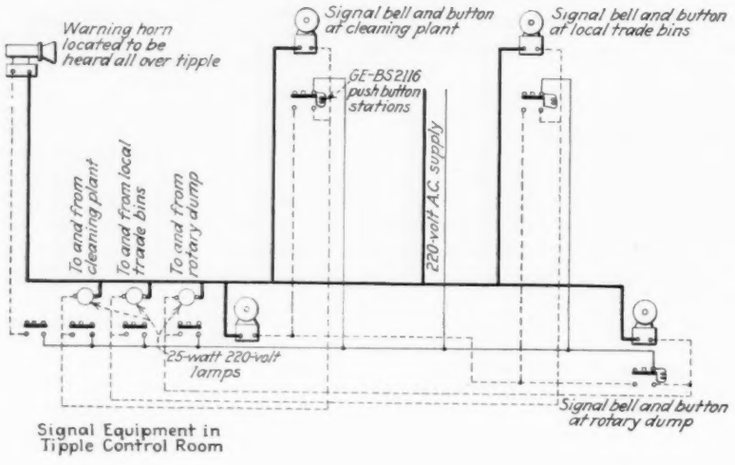
Referring to the accompanying wiring diagram, there is a bell and push button in the cleaning plant, at the local trade bins, and at the rotary dump, each for communication with the tipple only. In the tipple is a bell common to each of the foregoing points and there are three lamps and three push buttons in pairs to the respective outgoing circuits. A horn operated from a fourth push button, to serve as a general warning over the tipple when the equipment therein is to be started, completes the equipment.

When the dumper pushes his button the contact energizes three parallel circuits, one through his bell, the ringing of which indicates that the button is making contact, one through the common bell in the tipple control room, and the third through the tipple control-room lamp located adjacent to the button communicating with the dumper. Ringing of the tipple bell tells that some station is signaling, and the lighting of a certain lamp indicates which one.

When the tipple operative wishes to answer he pushes a button which energizes two parallel circuits, one through the dump indicating lamp, the lighting of which assures that the button is making contact, and the other through a bell at the dump. This two-way signaling with indications that buttons are making contact is accomplished with few wires. There are but four to each of the three stations and but six leaving the tipple control room, not counting the circuit to the warning horn.

A. L. Lee, chief electrician at the mine laid out the signal system for Allen & Garcia Co., engineers for the new plant.

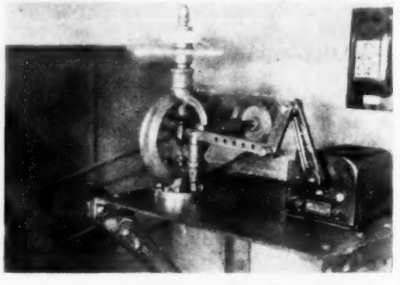
Wiring Diagram of Signal System at Wildwood Plant


Warning horn located to be heard all over tipple
Signal bell and button at cleaning plant
Signal bell and button at local trade bins
GE-BS2116 push button stations
220-volt A.C. supply
To and from cleaning plant
To and from local trade bins
To and from rotary dump
25-watt 220-volt lamps
Signal bell and button at rotary dump
Signal Equipment in Tipple Control Room

Fan Governor Connected to Double-Duty Switch

Use of fly-ball governors on mine fans to give warning if the fan stops is not new. At the new mine of the Butler Consolidated Coal Co., Wildwood, Pa., this type of device has been installed, but in conjunction with a drum switch which opens one circuit and closes another.

The fan, which is driven electrically and is unattended, is about 1,000 ft. from the lamp house where the warning signal is given. Here is located a



Operates a Switch Which Closes One Circuit and Breaks Another

lamp which is normally lighted all of the time and also a bell. In case the fan should stop or the governor belt break or slip, the lamp goes out and the bell rings. The switch, which is operated by the governor, is a General Electric type CR9420.

Backstop Takes Hold With Slight Reversal

To prevent reversal of the slope conveyor belt at Wildwood (Pa.) mine of the Butler Consolidated Coal Co., a backstop of recent design has been installed. Its application to the sheave of the Texrope drive is shown in the accompanying photograph.

This sheave, driven by a 250-hp. motor is on the shaft of the main-drive pulley of the conveyor belt. The latter

Backstop in "Set" Position

is a 54-in. 12-ply and the conveyor is 900 ft. long between centers of head and tail pulleys. The backstop consists of two wooden blocks mounted at the ends of arms keyed to a shaft and counterbalanced by adjustable weights on the opposite side. Fastened to the ends of the shaft are arms, against which the sides of the sheave rub.

Normal rotation, referring to the photograph, is "up." Friction against the side arms rotates the shaft slightly to a position holding the wooden blocks away from the sheave. Slight reversal of the sheave causes the side arms to pull the blocks down and stop the sheave by wedging against it. The angle of the main arms with respect to the tangent of the sheave circumference is such as to cause this wedging or binding effect.

Wearing surfaces of the side arms are covered with asbestos brake lining. With the relatively slight spring tensions necessary these brake linings should last a year or perhaps several years.

A. A. LeRoy, of Castle Gate, Utah, patented the stop.

Editorial Responsibility

Attention is called to the fact that the majority of the operating ideas presented in this issue are devoted to Wildwood. Though these items supplement major methods, practices and other considerations featuring this mine, described in the main editorial body of this issue, they are no less useful to readers. That Wildwood is new emphasizes the importance of applied ideas to final results. Operating ideas are looked upon editorially as being as great a service as any offered by *Coal Age*, in proportion to the field of usefulness. The editors fully appreciate this responsibility to the reader and spare no pains or expense to give him examples of best practices. Your co-operation is requested. Send in your ideas, with illustrations. Each will be paid for at a minimum rate of $5.

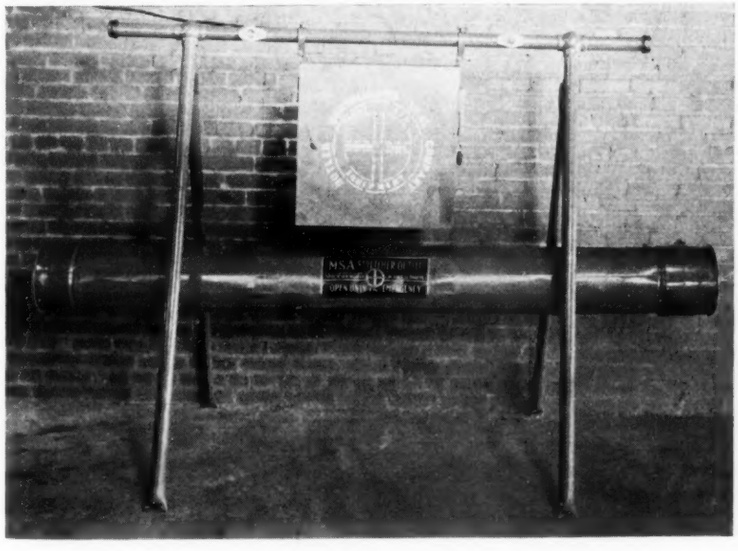
Portable First-Aid Station Speeds Treatment

The speed with which coal is extracted by mechanized methods at the Wildwood mine has made it necessary to incorporate portability in the design of first-aid equipment. In the photograph is shown the standard portable first-aid equipment station in use at this plant.

The frame is made up of 2-in. pipe, joined by standard fittings. Feet are formed by heating and closing the bottom ends of the leg pipes. Two small lamps on the horizontal ridge bar light the station. Two chains, each hung between a pair of legs, hold the stretcher outfit. Hot pads, a large first-aid kit, and other paraphernalia for treating injuries are housed in a wooden box. This box is suspended by swinging collars on the ridge pipe. The hinged door is padlocked and the key is inclosed by glass at the side of the box, as is the key to a municipal fire-alarm box.

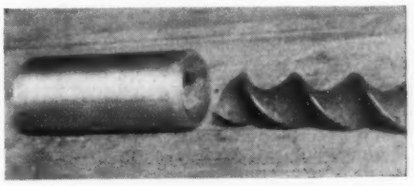
Two men can readily move this station. A number of them are now installed, being located in a crosscut off a tracked heading. No advance preparation, such as the placing of pegs in the ribs for the stretcher outfit, or the cutting of a niche in the coal for the first-aid kit is needed when the equipment is moved. The portability of the station encourages keeping it where it may be most needed.

No Delay in Treating the Injured When This Unit Is Installed



New Chuck Takes Augers Without Shanks

Annoyance and expense from breaking the square shanks off the coal augers used with mounted drilling machines in the Wildwood (Pa.) mine of the Butler Consolidated Coal Co., caused A. L. Lee, chief electrician, to attempt the making of an improved chuck. Preliminary working tests with the one shown in the photographs indicate that its adoption will eliminate the trouble.



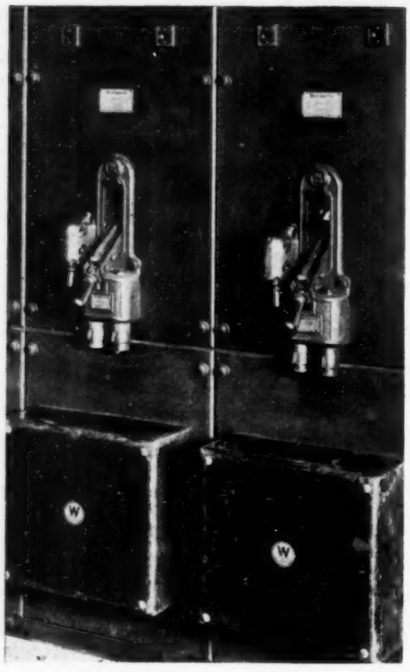
Showing Auger in and out of Chuck

Expense of forging or welding shanks on the augers is eliminated. The chuck has a spiral cavity into which the auger screws with sufficient clearance so that it is put in and taken out by hand without a wrench, yet the clutch will pull it out of the hole in the coal. The bottom of the spiral cavity is near the center of the chuck. The experimental chuck shown was made by casting babbitt into a steel shell and around a bit

which had been covered with a thin layer of asbestos. It is expected that the regular chucks will be made of cast steel.

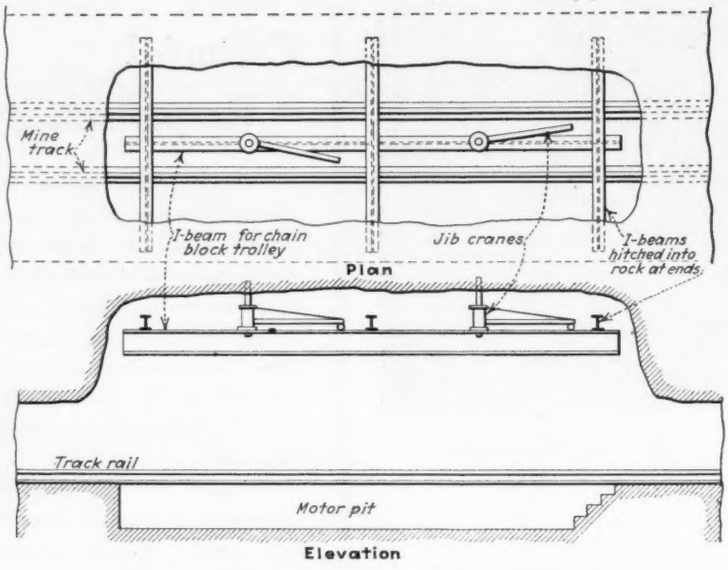
Test Receptacles Included On Switch Panels

Switch panels controlling six power circuits and located in the hoist house at Wildwood mine of the Butler Consolidated Coal Co., Wildwood, Pa., are equipped with test receptacles in the current transformer secondary circuits.



Current Receptacles Appear at Top

Four of these receptacles appear at the top of the accompanying photograph of a section of the panel group. This assures convenience in testing the circuits with portable meters.



Illustrating Hoisting Arrangement Above Motor Pit

Jib Cranes Mounted Above Motor Pit I-Beams

An overhead I-beam set parallel to and directly above the center of the track is the usual arrangement at the well-equipped motor pit. The chain block is supported from a trolley which runs on this beam. It is a good arrangement, except that there is some difficulty in landing an armature or other heavy load on the floor over the side of the locomotive, unless the chain block support is rather high above the floor. In several instances the I-beam has been mounted on wheels and tracks at the ends, thus making it a traveling crane. Another way of providing for the swinging of loads to the side is by installing a small jib crane as is the plan being followed in equipping the motor pit in Wildwood (Pa.) mine of the Butler Consolidated Coal Co.

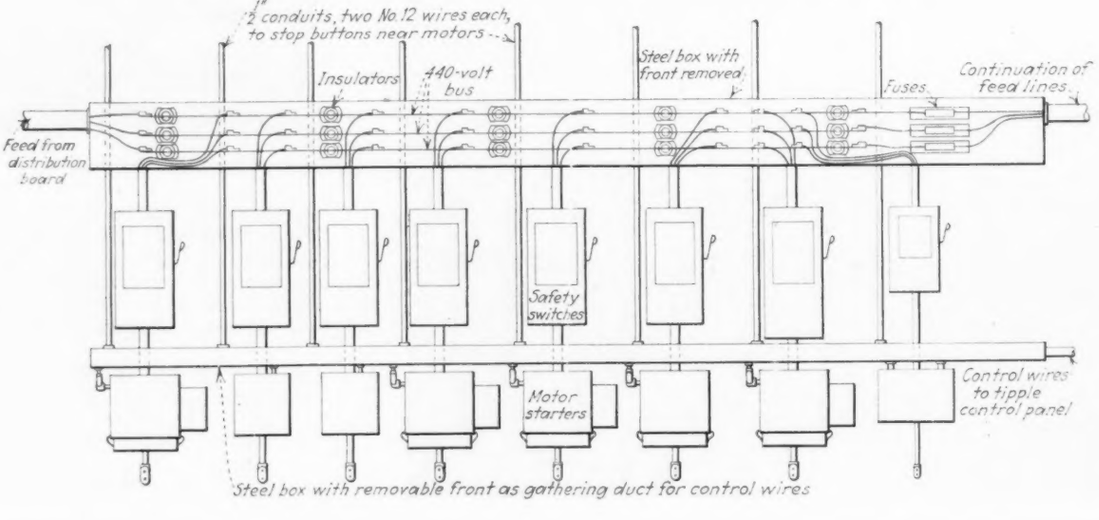
The method is indicated by the accompanying sketch. The jib cranes rotate about vertical supports anchored in the rock at the top and to the main I-beam at the bottom. Rings or hooks are fastened to the ends of the arms for convenience in attaching chain blocks or ropes.

Long Steel Boxes Simplify Wiring to Starters

Exclusive use of conduit and fittings for incasing the power and control circuits to a group of safety switches and motor starters is difficult and complicated. The accompanying drawing indicates how steel boxes were used to house the power bus and to gather the control wires in the new tipple of the Butler Consolidated Coal Co., Wildwood, Pa.

The safety switches and automatic starters of eight 440-volt motors ranging

Long Boxes of Steel House the Buses and Connections and Gather the Control Wires


1" conduits, two No.12 wires each, to stop buttons near motors
Insulators
440-volt bus
Steel box with front removed
Fuses
Continuation of feed lines
Feed from distribution board
Safety switches
Motor starters
Control wires to tipple control panel
Steel box with removable front as gathering duct for control wires

from 15 to 50 hp. are closely grouped on a skeleton steel frame. In each case the switch is directly above the starter, and extending between them for the length of the group is the steel box into which the control wires from each starter are taken. At convenient points ½-in. conduits leave the box to carry the control wires to safety inspection stop buttons at the motors. All control wires going to the tipple control board leave the box in a larger conduit at the right-hand end.

In both cases the fronts of the steel boxes are attached with capscrews, allowing convenient removal for making changes, inspections, or repairs. The job represents an economical method of construction but one which is neat and meets the approval of maintenance men.

How Should Holes Be Drilled For Blasting?

Though fundamentals have been developed by experience for every phase of blasting, violation of best practice in one particular or another is widespread. Perhaps the one principle most flagrantly violated has to do with the direction of shotholes with respect to the roof or bottom.

A duPont booklet, entitled "Permissible Explosives," recommends that holes be drilled as nearly horizontal as possible. When a local condition requires the back of the hole to reach the roof or floor, the hole should be started as close as possible to the vertical extremities of the seam. High coal is no excuse for angling roof holes. Benches should be provided to enable the miner to reach the proper elevation. Generally, only in thin coal, or where strong bands must be broken, may it be advantageous to drill the holes at a vertical angle.

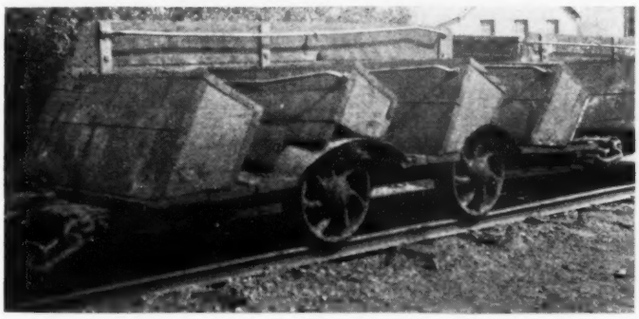
Special Car for Man-Trips In Pitching Seams

Whether men are transported to and from the working places in standard mine cars or in cars of a special type, care must be taken to provide against accidents from equipment failure. The need of special cars indicates the existence of greater dangers and consequently requires the exercise of more than usual care in the design of equipment.

At the International mine, Coleman, Alberta, Canada, writes Moses Johnson, men are lowered down the planes in cars of special design to various levels, the lowest being 2,000 ft. on the full pitch of the seam. Four cars constitute a trip, and a trip accommodates 40 men.

As the seam pitches heavily, the seats are built at the inclination to the car floor which will enable the men to sit upright while riding the slope. Front and side handlebars are installed on the car. That side of the car which is nearest the rib is built up about a foot above the seats, and the wheels are covered by heavy metal guards. In addition to those at the center of the cars, drawbars and couplings are attached to each side.

Men Can Sit Upright in This Car

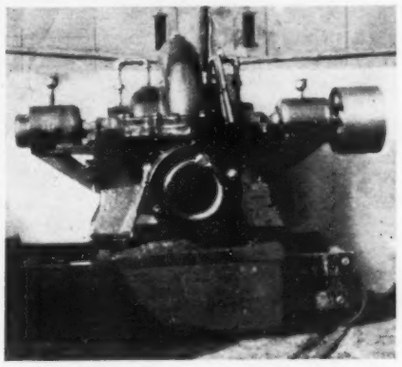


Acid Attacked Other Pumps But Not This One

"At several of our mines," writes R. M. Harrah, chief electrical engineer, Pittsburgh Terminal Coal Corporation, "we have encountered acid water that would destroy an acid-resisting bronze impeller in two or three weeks and a pump casing of the same metal in one to two months. In this water cast-iron pipe would last only 24 to 36 hours. An analysis of this water, most of which came from old workings, showed from 6 to 36 grains of sulphuric acid per gallon."

So serious were the conditions encountered that it was deemed immediately necessary to replace seven of the pumps in service with units built of more resistant metal. The pumps were built in the company shops and the metal chosen was Duraloy. One of the pumps is shown in the accompanying photograph. It is a 5-in. centrifugal type of the double-suction type, with a 6-in. suction and a 5-in. discharge. The impellers are of the machined, balanced, and inclosed type, mounted on Timken double roller bearings.

The pumps were designed to deliver 500 gal. per minute against a 200-ft. head. One unit actually pumped 506



A 5-In. Centrifugal Pump With Acid-Resisting Properties

gal. per minute against a 216-ft. head. "In this installation," continues Mr. Harrah, "it ran continuously for six months and pumped 129,600,000 gal. of water at a total maintenance cost of 72c. for packing and grease. At the end of this run the unit was dismantled and showed no noticeable wear. In fact, the machining marks were still on the impeller. The cost of these pumps each was little in excess of the cost of a bronze unit of the same size and capacity."

Glazed Window in Mine Door Is a Safety Precaution

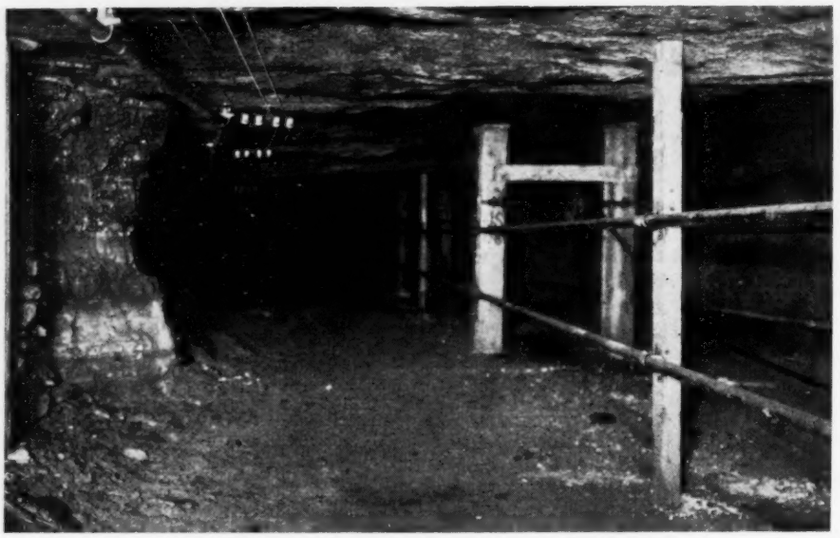
Mine doors constitute an obstruction to view which may be the cause of an accident. When a man is in the act of opening a door from the intake side as a locomotive or trip pulls up to the door from the opposite side, his life is in peril. Safety rules, of course, stipulate that the locomotive be stopped in the clear of the door and that the trip rider open and hold the door by hand for the passage of the rolling stock. But the rule is likely to be disregarded.

As a safeguard against this danger, a glass window is built into the mine doors at the No. 8 mine of the Wheeling & Lake Erie Coal Mining Co., at Fair Point, Ohio. The window is placed at the end which is away from the hinges and approximately one-fourth of the way down from roof to bottom. Contrary to what might be supposed, no trouble has been experienced from the breaking of the windows.

Guarded Fleetways Make Mines Safer

Because it is impractical to guard plane and slope haulage ropes completely there is a tendency to leave them unguarded even where a guard would in no way interfere with operation.

That guarding is not neglected in mines of The Hudson Coal Co. is indicated by the accompanying illustration of a fleetway leading from a 150-hp.



Rope Fleetway at Right Is Guarded by Railings

electric hoist. It is at No. 18 plane, New County Vein, Grassy Island mine of Olyphant colliery. In this fleetway, the rope, which transmits a 11,000-lb. pull, is guarded on each side by a railing.

Suspended from the roof, to the left of the illustration, is the 2,300-volt wire-armored cable which feeds the hoist motor. The neat manner in which this cable and the signal and telephone wires beside it are supported is typical of all electrical installations that have been made in the Hudson mines during the last few years.

Broken Tap Bolts Removed By Arc Welder

"I have spent hours taking out broken capscrews and tap bolts by using a drill and a back-out tool. And I have removed others of the same type under similar condition in five minutes by arc-welding a $\frac{1}{8}$-in. oversize nut to the bolts or screws, backing them out easily with a wrench." Thus comments C. F. Jones, Ottawa, W. Va., in a contribution on his experience on this job.

By this method a bolt that is broken $\frac{1}{2}$ in. inside the tap hole can be extracted without damage to the threads. First clean the exposed surface of the broken bolt, then place the nut over the hole, and build up the welding metal, starting at the diametrical center of the bolt and widening out to the mouth of the hole and the nut; finally close the hole of the nut with the molten metal. These steps complete the hardest part of the job.

To remove the bolt, simply apply water to it and use a wrench. The expansion of the bolt caused by the intense heat from the welding arc and the contraction effected by welding, together ease the snugness of the thread surface fit and make the backing-out job a simple matter.

According to Mr. Jones, broken bolts as small as $\frac{3}{8}$ in. in iron or steel and $\frac{1}{8}$ in. in copper or brass can be removed by this scheme. No nut is necessary for the removal of bolts of the smaller diameters mentioned.

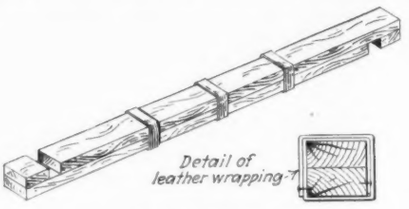
Adjustable Work Holder For Anvil Jobs

A blacksmith at a mine plant is called upon to handle forging jobs of all descriptions. Much of his work is with odd-shaped and unwieldy pieces which he cannot handle alone unless provided with equipment for holding them in position across the anvil. As few of his jobs are repetitive, installation of elaborate equipment is entirely out of the question.

At one mine in Illinois elongated pieces, such as bar steel, are held across the anvil by a simple rigging which combines a swinging jib with a trolley type carrier. The beam of the jib acts as a track on which the carrier travels. Adjustment of the rigging can be made in three planes.

This Adjustable Timber Gage Does Not Slip

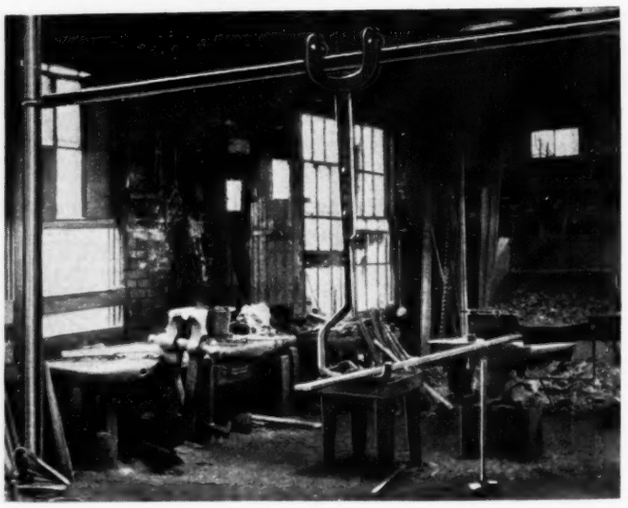
A useful timber gage for underground use, according to A. F. Johnstone, Jack Horn, Ky., can be made from two pieces of hardwood, $1\frac{1}{2}$ to 2 in. wide and $\frac{1}{2}$ to $\frac{3}{4}$ in. thick, cut to three-fourths of the average height of the coal seam, and from three pieces of leather. As shown in the sketch, tack a small block of wood on one end of each piece. Place the two sticks together so that the small blocks serve as stops. Each of the three pieces of leather should be about $1\frac{1}{2}$ in. wide and long enough to wrap around both sticks of wood twice. The leathers are held in place by tacks.



Details of Timber Gage

Mr. Johnstone's comments on this gage are as follows: "I am using one of these gages that I made some six months ago and would not be without it, as I do a great deal of timbering in pillar work. It enables me to get the exact measurements of my timbers without loss of time. It is light in weight and will not slip."

A Handy Andy for the Smithy



AMONG THE MANUFACTURERS

C. BRIGHAM ALLEN, JR., has been appointed district sales representative for the Reliance Electric & Engineering Co., Cleveland, Ohio, with headquarters in Philadelphia, Pa. E. A. CLARK, sales engineer at the Philadelphia office of the company, has been transferred to the engineering department at Cleveland, where he will be engaged in the design of d.c. motors. RALPH R. NEWQUIST has been appointed sales engineer, with headquarters at the Chicago office of the company.

* * *

HUGH A. WILSON has been appointed technical service director of the Union Explosives Co., and CHARLES HEFFNER has been made sales agent. Both men will have their headquarters at Pottsville, Pa.

* * *

LEEDS & NORTHRUP Co. has moved its Cleveland (Ohio) office to 1491 Union Trust Building.

* * *

W. H. BUTCHER, for 24 years purchasing agent of the former Atlas Portland Cement Co., has been made purchasing agent for the Universal Atlas Cement Co., Chicago.

* * *

SIMPLEX WIRE & CABLE Co., Boston, Mass., has opened a branch office in the Fidelity-Philadelphia Trust Building, Philadelphia, Pa., under the management of Elden L. Howe.

* * *

MORLEY S. SLOMAN, with the Pittsburgh (Pa.) office of the Sullivan Machinery Co., Chicago, has been made manager of the Huntington (W. Va.) office, vice John S. Walker, Jr., retired.

* * *

LINCOLN ELECTRIC Co., Cleveland, Ohio, has opened branch offices as follows: 338 Barnard Street, Saginaw, Mich.; Ft. Wayne, Ind., and 225 E. Columbia Street, Oil City, Pa. Three men have been transferred from the manufacturing division to the welder division, as follows: JOHN O. ARDAGH to Chicago; R. A. KYLE to New York City, and ROBERT NEWTON to the factory at Cleveland.

CHICAGO PNEUMATIC TOOL Co., New York City, has opened branch offices as follows: Perrine Building, Oklahoma City, Okla.; 327 Philcade Building, Tulsa, Okla., and Merchants & Manufacturers Building, Houston, Texas.

* * *

NEW YORK CITY office of the Hill Clutch Machine & Foundry Co., Cleveland, Ohio, has been reopened, and will be in charge of A. L. Whiteside.

* * *

EDWIN N. HAZLETT, formerly with the Duquesne Light Co., McKeesport, Pa., has joined the sales engineering department of the Copperweld Steel Co., Glassport, Pa.

* * *

ELECTRIC MACHINERY MFG. Co., Minneapolis, Minn., has moved its Baltimore (Md.) office to 600 North Calvert Street.

* * *

BULLARD-DAVIS, INC., San Francisco, Calif., has changed its name to E. D. Bullard Co., and purchased the First Aid Equipment & Supply Co., Los Angeles, Calif.

UNITED STATES CHAIN & FORGING Co., Pittsburgh, Pa., announces the following promotions: L. A. GARBER, former Western district sales manager, has been made general sales manager; W. L. REILLY, a member of the headquarters staff, has been named assistant general sales manager; L. K. ROBINSON, former head of New England sales, has been made Eastern district manager, with headquarters in New York City, and HARLEY MORRIS, salesman in the Western division, has been appointed Western district sales manager, with headquarters in Chicago.

* * *

J. D. STOUT, manager of the New York City office of the Terry Steam Turbine Co., Hartford, Conn., has been elected vice-president of the company and will make his headquarters at the home office. T. G. HART, manager of the Chicago office, has been made general manager, and will be stationed at Hartford.

* * *

B. VAN DYKE, of the Quincy (Ill.) sales division of the Gardner-Denver Co., has been transferred to New York City; HENDRICK STOLK, formerly with Stokvis & Zonen, Holland, has been transferred from Quincy to St. Louis, Mo.

* * *

MORRIS MACHINE WORKS has removed their New York City office to 225 West 34th Street.

Trade Literature

Heliflex Bearings. Roller Bearing Co. of America, Trenton, N. J. Catalog No. 40; 36 pp., illustrated. Discusses shock absorbing, characteristics, alignment, lubrication, etc.

Track Equipment. West Virginia Rail Co., Huntington, W. Va. Catalog C; 159 pp., illustrated. Covers steel rails and accessories, concrete reinforcing bars, steel mine ties, frogs, switches, switch stands, steel turnouts, and track work accessories.

Electric Motor Buckets, Bulletin 700, 11 pp., illustrated, and Digging Clam Shell Bucket, Class K, Bulletin 654, 7 pp., illustrated, are two bulletins recently issued by the Hayward Co., New York City.

Rex-Stearns Belt Conveyors. Stearns Conveyor Co., Cleveland, Ohio. Pp. 96, illustrated. Besides giving engineering data, this book contains information on the design and application of Timken idlers for all types of belt conveyors.

Type AA Reliance Induction Motors, With Ball Bearings for Two and Three-Phase A. C. Circuits. Reliance Electric & Engineering Co., Cleveland, Ohio. Bulletin 106; 15 pp., illustrated.

Arc Welding in Industry. General Electric Co., Schenectady, N. Y. GEA—995A; 40 pp., illustrated.

Railway Steel Cross Ties. Carnegie Steel Co., Pittsburgh, Pa. Pp. 37, illustrated.

Pipe Couplings for Steel, Wrought Iron, and Cast Iron Pipe. Victaulic Co. of America, New York City. Pp. 11, illustrated.

Pulverizing Mills. Fuller Lehigh Co., Fullerton, Pa. Bulletin 902. Folder illustrating and describing the air-separation type and the screen-separation type.

A Handbook of Rock Drill Steel; Sullivan Machinery Co., Chicago; Circular No. 72-K; 48 pp., illustrated. Describes the selection, heating, forging, and tempering of rock drill steel, and includes instructions for the care and use of drill sharpeners and drill steel furnaces.

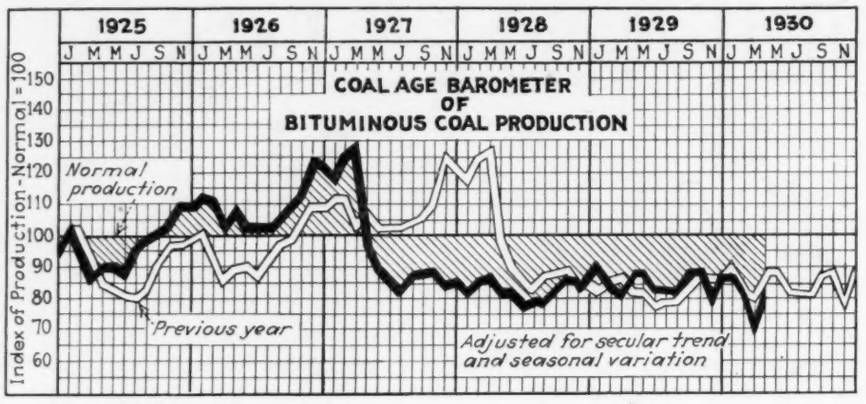
Pump Fax; Goulds Pumps, Inc., Seneca Falls, N. Y.; Bulletin 400; 63 pp., illustrated. Gives data and information on the characteristics, installation and operation of pumps.

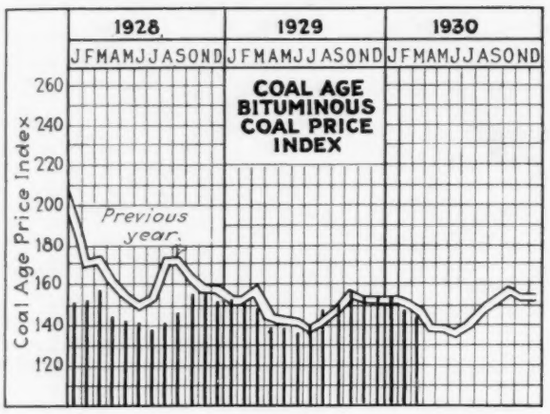
Oxwelded Construction for Modern Piping Services; Linde Air Products Co., New York City; pp. 77, illustrated. Covers salient facts concerning the welding of steel and wrought iron piping.

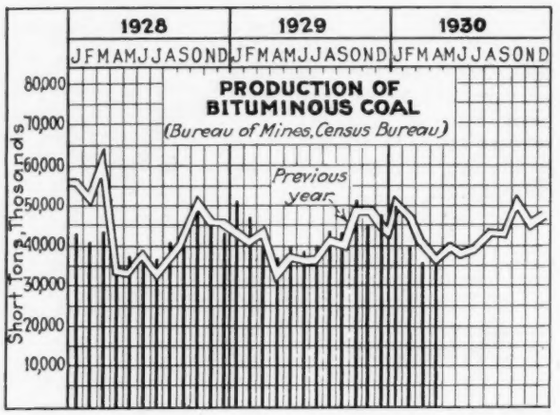
Quality Engineering is the title of an 18-pp. illustrated booklet issued by the American Hoist & Derrick Co., St. Paul, Minn., describing its dragline cranes, gasoline and electric derrick hoists, drag-scraper hoist, etc.

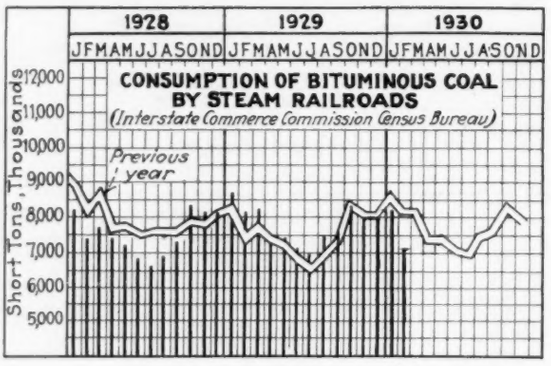
Water Turbines; De Laval Steam Turbine Co., Trenton, N. J.; E-1132; 15 pp., illustrated. Describes small water turbines of the reaction, inward flow, or vortex type.

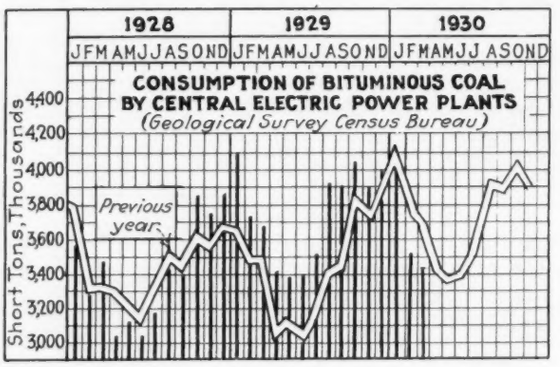
Indicators of Activities in the Coal Industry

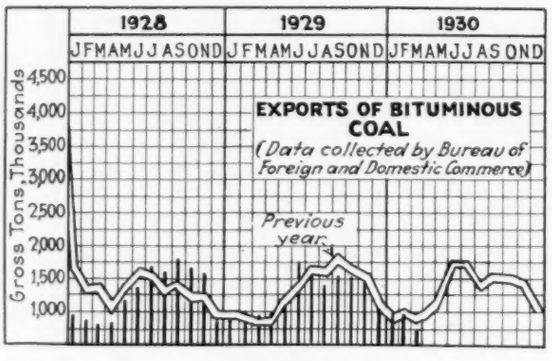


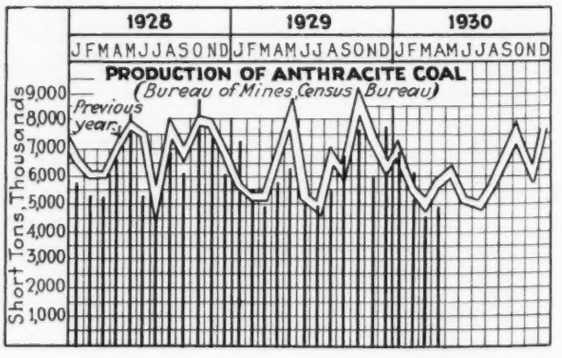












MARKETS in Review

APRIL was a hectic month in the bituminous coal markets of the country. Marked curtailment in the demand for domestic sizes resulted in difficulties in adjusting production schedules and made steam sizes, particularly screenings, the leaders in the markets. Uncertainty during the period of spring price adjustments was a factor which adversely affected business. On the other hand, the advent of the lake season resulted in a renewal of optimism, though reports of exceptionally low prices on this business were current. Contracting still lagged as compared to other seasons, as did replenishment of stockpiles. A slight decrease in production for the second quarter of the year is forecast by the regional shippers' advisory boards. Total loadings of coal and coke for the three-months period are expected to be 2,162,318 cars, a decrease of 1.4 per cent from the 1929 figure of 2,191,711 cars.

April production of bituminous coal is estimated by the U. S. Bureau of Mines at 35,750,000 net tons, a decrease of 23,000 net tons from that of March, and of 1,630,000 net tons from that of April, 1929. Anthracite production was estimated at 4,899,000 net tons for April. This compares with 4,551,000 in the preceding month and 6,441,000 net tons in April, 1929. *Coal Age* Index of spot bituminous prices (preliminary) was: 142, April 5; 141, April 12; 142, April 19; and 141, April 26. The corresponding weighted average prices were: $1.72, April 5; $1.71, April 12; $1.72, April 19; and $1.71, April 26. The revised Index figures for March were as follows: 144, March 1; 146, March 8, 15, and 22; and 143, March 29. Corresponding weighted average prices were: $1.74, March 1; $1.77, March 8; $1.76, March 15 and 22; and $1.73, March 29. The monthly Index for March was 145, as compared to the unrevised figure of 141½ for April. The average level of prices in March, therefore, was substantially lower than in March last year, while in April of this year, the level was slightly higher than in the same month in 1929.

With the opening of the season last month total dumpings at the lower lake ports to April 27 were as follows: cargo, 1,369,765 tons; bunker fuel, 48,700 tons. For the season to April 27, 1929, cargo dumpings were 2,357,502 tons and bunker fuel loadings were 86,970 tons.

Dullness pervaded the anthracite markets of the country until April 22, when price reductions on domestic sizes went into effect. Following cuts by the producers, a buying rush started in, helped by a little cold weather and the small supplies in the hands of the retailers. In the steam division, there was a fair activity over most of the month. Curtailed production resulted in a severe shortage of buckwheat and, to a lesser extent, in rice and barley.

NEITHER price reductions nor price advances had much effect on demand in the Chicago bituminous market in April. Cuts of 25c.@50c. on Eastern prepared coals early in the month had little effect, as they had been anticipated by sales in the spot market prior to the adjustments. Early announcements of advances of 15c. and 10c. on southern Illinois and western Kentucky coals, respectively, were offset by previous purchases and the fact that retailers and steam consumers generally had markedly curtailed buying during the month. With the former, this attitude resulted from the change in the coal year from March 31 to April 30, and with the latter, from a desire to clean up storage piles.

Retailers moved a minimum of coal. Household buying was sharply curtailed in anticipation of price reductions, and poor credit conditions still further reduced sales. Dealers refused to deliver coal in larger quantities than customers could pay for, either on receipt or in the regular 30-day period. Retail prices were reduced 10c. to $1.75 on May 1, and prices on steam sizes were advanced slightly at the same time.

RETAIL stocks were down as a rule, but bargain prices caused some replenishment of supplies. Smokeless lump could be had at $2, and some retailers bought supplies at this figure, expecting to sell it later as mine-run. Better buying developed at the last of the month. Orders for May shipment were an encouraging factor and the number of "no bills" at the mines was reduced materially at the end of the month, though they were still numerous in some sections.

Middle Western screenings, particularly second-grade varieties, were a problem to practically all sellers throughout most of the month. Vigorous attempts were made to bolster the market by certain producers. Reports were spread of buying on the part of consumers in the Northwest who failed to get coal on contracts because of the shortage at the Head of the Lakes. Some orders were placed by public util-

Current Quotations—Spot Prices, Anthracite—Gross Tons, F. O. B. Mines

		Week Ended							
		April 5, 1930		April 12, 1930		April 19, 1930		April 26, 1930	
	Market Quoted	Independent	Company	Independent	Company	Independent	Company	Independent	Company
Broken	New York	.....	$8.20@$8.50	.....	$8.20@$8.50	.....	$8.20@$8.50	.....	$8.00
Broken	Philadelphia	$8.40@$8.50	8.40	$8.40@$8.50	8.40	$8.40@$8.50	8.40	.....	.....
Egg	New York	8.45@ 8.70	8.70	8.45@ 8.70	8.70	8.45@ 8.70	8.70	$8.10	8.10
Egg	Philadelphia	8.60@ 8.85	8.60	8.60@ 8.85	8.60	8.60@ 8.85	8.60	8.10	8.10
Egg	Chicago*	7.77	7.77	7.77	7.77	7.77	7.77	7.23	7.23
Stove	New York	9.00@ 9.20	9.20	9.00@ 9.20	9.20	9.00@ 9.20	9.20	8.60	8.60
Stove	Philadelphia	9.10@ 9.35	9.10	9.10@ 9.35	9.10	9.10@ 9.35	9.10	8.60	8.60
Stove	Chicago*	8.22	8.22	8.22	8.22	8.22	8.22	7.68	7.68
Chestnut	New York	8.60@ 8.70	8.70	8.60@ 8.70	8.70	8.50@ 8.70	8.70	8.10	8.10
Chestnut	Philadelphia	8.60@ 8.85	8.60	8.60@ 8.85	8.60	8.60@ 8.85	8.60	8.10	8.10
Chestnut	Chicago*	7.77	7.77	7.77	7.77	7.77	7.77	7.23	7.23
Pea	New York	4.75@ 5.00	5.00	4.75@ 5.00	5.00	4.75@ 5.00	5.00	4.25@ 4.40	4.40
Pea	Philadelphia	4.90@ 5.15	4.90	4.90@ 5.15	4.90	4.90@ 5.15	4.90	4.40@ 4.65	4.40
Pea	Chicago*	4.46	4.46	4.46	4.46	4.46	4.46	3.93	3.93
Buckwheat	New York	3.25@ 3.50	3.00†	3.50@ 3.75	3.00†	3.25@ 3.75	3.00†	3.25@ 3.50	3.00†
Buckwheat	Philadelphia	2.75@ 3.00	2.75	2.75@ 3.00	2.75	2.75@ 3.00	2.75	2.75@ 3.00	2.75
Rice	New York	1.65@ 2.00	2.00	1.65@ 2.00	2.00	1.65@ 2.00	2.00	1.60@ 2.00	2.00
Rice	Philadelphia	2.00@ 2.25	2.00	2.00@ 2.25	2.00	2.00@ 2.25	2.00	2.00@ 2.25	2.00
Barley	New York	1.25@ 1.50	1.50	1.25@ 1.50	1.50	1.25@ 1.50	1.50	1.25@ 1.50	1.50
Barley	Philadelphia	1.50@ 1.60	1.50	1.50@ 1.60	1.50	1.50@ 1.60	1.50	1.50@ 1.60	1.50

*Net tons, f.o.b. mines. †Domestic buckwheat, $3.50 (D.L. & W.)

ity interests in the Northwest, but buying in general was light.

High-grade screenings from Illinois, Indiana and western Kentucky were scarce and tight during the first half of the month. As the month wore on, the condition became more evident and resulted in an advance of 10c., effective May 1. Some producers, with no coal to sell in the open market, asked for the advance in the last few days of April. Sporadic labor disturbances in Illinois had no material effect on the market and industrial buyers in general were inclined to discount rumors of a general suspension. Strikes in western Kentucky were ignored by both operators and buyers. The producers had no market for the coal and, in most cases, welcomed the suspensions which occurred at about twelve mines in Webster County.

COLD weather in the first part of April helped the St. Louis market, though it sagged sharply after a brief flurry. Screenings were adversely affected by the increase in domestic sales, and never fully recovered over the rest of the month. Little coal was moving at the last of the month, and screenings had dropped about 15c.

Buying at the Head of the Lakes during April was on the basis of immediate needs, which was characteristic for the period of the year, but dock operators looked forward to an expansion in the month of May. Total shipments from the docks in April dropped 2,000 cars from the 15,528 mark of March, though the movement was considered to be about normal. Dock operators were pleased with the small carryover from the old year. Supplies of bituminous coal on the docks on April 1 were estimated at 3,000,000 tons, while anthracite stocks were placed at about 300,000 tons. Shipments from railroad fuel piles to the interior were in fair volume during the month. Screenings and broken lots, on the other hand, manifested an easing tendency. No material recessions are expected, however.

Prices at the end of the month were as follows: Youghiogheny and Hocking lump, $5.35; dock-run, $4.50; screenings, $3.85; Pocahontas lump, $7.90; mine-run, $5; screenings, $4.10; splint lump, $5.60; dock-run, $4.75; screenings, $3.85; anthracite egg, $12.85; stove, $13.30; chestnut, $12.85; pea, $9.25, and buckwheat, $7.45.

Domestic demand in the Southwest was practically nil in the month of April. On the other hand, some strip operations producing crushed mine-run for the steam trade were fairly active. Except for the shovels, however, most of the Southwestern mines were closed down for the season. April prices for Arkansas semi-anthracite lump and egg were $4@$4.50, and for McAlester (Okla.) lump, $5. June storage prices announced for Spadra (Ark.) anthracite, are as follows: grate, egg and range, $5.50; No. 4, $6.

THE BOTTOM apparently dropped out of the Colorado market in April, though a few orders for immediate consumption were received during the month. As a result, production was curtailed to the lowest point in years, with the mines running only 30 per cent of capacity. Ruling prices were: Colorado bituminous lump, $4.50; nut, $4.25; slack, $1.50@$1.75; Rock Springs-Kemmerer lump, $4.25; nut, $3.75; and slack, $1.40.

A slight decline in prices was the only change in the Louisville market in April. Demand was slow for everything but steam coal. Screenings, what there were produced, were easily disposed of, some consumers even buying mine-run and crushing it to meet their requirements. Nut coal moved freely for use in place of stove, but other prepared sizes were a drug on the market. Retailers reduced prices for April stocking and delivered some coal, but not a great deal. During the month, mines in eastern Kentucky reported a slightly better demand for lake coal and good prospects for the future. Western Kentucky, on the other hand, pursued a waiting policy.

Prices at the last of the month were: eastern Kentucky block, $1.75@$2.25; off-grade block, $1.75 or less; premium block, $2.25@$2.45; lump and egg, $1.50@$1.85; nut, $1.35@$1.60; mine-run, $1.25@$1.60; and screenings, $1.10@$1.25; western Kentucky prepared, other than 3x2-in. nut, $1.25@$1.60; 3x2-in. nut, $1.60; mine-run, $1@$1.35, 15c. higher than the usual low; screenings, $1. Premium western Kentucky coals brought 25c.@40c. more than the prices quoted above. Contracting was slow during the month, as many of the steam buyers preferred to purchase their requirements at the lower levels prevailing in the spot market. If enough steam users adopt this policy, operators expect the increased demand to boost prices.

PENDING complete readjustment of the price situation, the Cincinnati market faltered during the month of April. Low prices on coal for the lakes made by two large shippers, coupled with rumors of other concessions, created uncertainty among West Virginia and Kentucky producers, and adversely affected the market. Another unfavorable aspect of the situation in April was the failure of large consumers to come into the market with the usual spring bale of orders, largely, they asserted, because the spread between spring prices and those that might be expected later in the summer was not enough. On the credit side of the ledger was the fact that movement through the Cincinnati gateways ran 1,000 cars above the average for the same period in 1929, disproving talk that purchasers had been hit by hard times.

Some signs of stabilization of smokeless prices was in evidence during the month. Quotations were firmly maintained at first, though there was some disposition to cut lump and egg prices at the last. Of the high-volatile coals, slack and steam sizes led the list, largely because of curtailment in the production of domestic sizes. Retail business dropped below the usual level for the season, despite strenuous efforts to bolster it up.

Some colder weather in April, coupled with a satisfactory industrial condition, resulted in a fairly active coal trade in Columbus. Though domestic sales were largely restricted to immediate wants, there was a fair volume of retail business in evidence. One of the best features of the trade was a tendency to stabilize prices.

Steam business attracted the bulk of

Current Quotations—Spot Prices, Bituminous Coal—Net Tons, F.O.B. Mines

LOW-VOLATILE, EASTERN	Market Quoted	Week Ended April 5, 1930	April 12, 1930	April 19, 1930	April 26, 1930
Smokeless lump	Columbus	$2.50@$2.75	$2.50@$2.75	$2.50@$2.75	$2.50@$2.75
Smokeless mine-run	Columbus	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00
Smokeless screenings	Columbus	1.40@ 1.55	1.40@ 1.60	1.45@ 1.60	1.45@ 1.60
Smokeless lump	Chicago	2.25@ 2.75	2.25@ 2.75	2.25@ 2.75	2.25@ 2.50
Smokeless mine-run	Chicago	1.75@ 2.25	1.75@ 2.25	1.75@ 2.25	1.65@ 2.00
Smokeless lump	Cincinnati	2.50	2.50	2.40@ 2.50	2.40@ 2.50
Smokeless mine-run	Cincinnati	1.75@ 2.00	1.85@ 2.00	1.90@ 2.00	1.90@ 2.00
Smokeless screenings	Cincinnati	1.35@ 1.40	1.35@ 1.50	1.35@ 1.45	1.35@ 1.45
*Smokeless mine-run	Boston	4.10@ 4.15	4.15@ 4.20	4.10@ 4.15	4.05@ 4.15
Clearfield mine-run	Boston	1.40@ 1.60	1.40@ 1.60	1.35@ 1.50	1.35@ 1.50
Cambria mine-run	Boston	1.60@ 2.00	1.60@ 2.00	1.60@ 2.00	1.60@ 1.90
Somerset mine-run	Boston	1.50@ 1.80	1.45@ 1.75	1.45@ 1.75	1.45@ 1.75
Pool 1 (Navy Standard)	New York	2.20@ 2.35	2.20@ 2.35	2.20@ 2.35	2.20@ 2.35
Pool 1 (Navy Standard)	Philadelphia	2.35@ 2.60	2.35@ 2.60	2.35@ 2.60	2.35@ 2.60
Pool 9 (super. low. vol.)	New York	1.85@ 2.00	1.85@ 2.00	1.85@ 2.00	1.85@ 2.00
Pool 9 (super. low. vol.)	Philadelphia	1.90@ 2.15	1.90@ 2.15	1.90@ 2.15	1.90@ 2.15
Pool 10 (h. gr. low. vol.)	New York	1.75@ 1.85	1.75@ 1.85	1.75@ 1.85	1.75@ 1.85
Pool 10 (h. gr. low. vol.)	Philadelphia	1.75@ 1.95	1.75@ 1.95	1.75@ 1.95	1.75@ 1.95
Pool 11 (low. vol.)	New York	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75
Pool 11 (low. vol.)	Philadelphia	1.55@ 1.75	1.55@ 1.75	1.55@ 1.75	1.55@ 1.75
HIGH-VOLATILE, EASTERN					
Pool 54–64 (gas and st.)	New York	$1.10@$1.35	$1.10@$1.35	$1.10@$1.35	$1.10@$1.35
Pool 54–64 (gas and st.)	Philadelphia	1.15@ 1.35	1.15@ 1.35	1.15@ 1.35	1.15@ 1.35
Pittsburgh sc'd gas	Pittsburgh	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00
Pittsburgh gas mine-run	Pittsburgh	1.65@ 1.75	1.65@ 1.75	1.65@ 1.75	1.65@ 1.75
Pittsburgh mine-run	Pittsburgh	1.40@ 1.65	1.40@ 1.65	1.40@ 1.65	1.40@ 1.65
Pittsburgh slack	Pittsburgh	1.10@ 1.30	1.10@ 1.25	1.00@ 1.25	1.00@ 1.25
Kanawha lump	Columbus	2.00@ 2.40	2.00@ 2.45	2.00@ 2.45	2.00@ 2.15
Kanawha mine-run	Columbus	1.35@ 1.50	1.35@ 1.50	1.35@ 1.50	1.35@ 1.60
Kanawha screenings	Columbus	1.10@ 1.20	1.10@ 1.25	1.10@ 1.25	1.10@ 1.25
W. Va. lump	Cincinnati	1.75@ 2.50	1.65@ 2.50	1.65@ 2.75	1.60@ 2.75
W. Va. gas mine-run	Cincinnati	1.40@ 1.60	1.40@ 1.60	1.40@ 1.60	1.40@ 1.60
W. Va. steam mine-run	Cincinnati	1.15@ 1.35	1.15@ 1.35	1.15@ 1.35	1.15@ 1.35
W. Va. screenings	Cincinnati	.85@ 1.00	.75@ 1.00	.80@ 1.00	1.00@ 1.15
Hocking lump	Columbus	2.00@ 2.15	2.00@ 2.15	2.00@ 2.15	2.00@ 2.15
Hocking mine-run	Columbus	1.35@ 1.60	1.35@ 1.65	1.35@ 1.65	1.35@ 1.60
Hocking screenings	Columbus	.85@ 1.00	.85@ 1.00	.90@ 1.10	.90@ 1.10

*Gross tons, f.o.b. vessel, Hampton Roads.

the attention during the month, with contracting a big feature. With the exception of some contracts for railroad fuel, most of the possible agreements were closed in April at prices 10c.@15c. higher than last year. Steam users evidenced a disposition to take a larger share of their requirements on contract, rather than depend on the spot market. Screenings led the list during the month, because of reduced production. Stocks in the hands of large steam users were still low, with some indication that steps would be taken to add to them in the future. Prospects for the lake trade were bright, and indications pointed to a large tonnage movement from eastern and southern Ohio fields in the coming season.

LUMP COAL moved slowly in the Pittsburgh market in April, though a slight flurry after the season had been considered closed resulted in a small increase in the volume of sales. Slack prices were firmer, by reason of the curtailed production. There were signs that some mine-run shipments would replace lump in the lake trade, thus resulting in better prices in the coming season. Generally speaking, industrial and railroad buying was slow during the month. Slack prices for the month were as follows: steam, 90c@$1.10; gas, as high as $1.25. There was no change in mine-run and lump prices. A small quantity of coal moved from the Pittsburgh district to the lakes, though what the future volume will be is unknown. Buyers, it was reported, were seeking exceptionally low quotations, while manifesting a reluctance to buy.

Dullness continued to pervade the central Pennsylvania market in April. Production slid down slightly at the last, though ruling prices were fairly well maintained throughout the month.

Conditions in the New England market failed to improve in the month of April. Steam coal continued to be a drug on the market. Little stoker coal was to be had, but prices on that, as well as on mine-run continued to drag the bottom. Gross-ton quotations, f.o.b. vessels of Virginia terminals, at the last of the month were as follows: Smokeless mine-run, top grade, $4.15; mine-run, $4.05@$4.10; nut-and-slack, $4.03. On cars at Boston for inland delivery, stoker coal was offered at $5.15, per net ton and mine-run at $5.50@$5.60. There was a big unsold surplus at practically every rehandling point, and cargoes arrived with too great frequency for the situation to improve. All-rail steam coal from central Pennsylvania continued to lag. Prices were very low, and only specialties were favored with much business.

THE domestic market in Birmingham failed to manifest much activity in April, and the tonnage sold for delivery in that month and in May and June was disappointing. Producers were forced to cut their running time in half to prevent accumulations of domestic sizes, for which disposition was slow and uncertain. Local dealers failed to add to their stocks and the bulk of the tonnage produced went outside of the district. Sales as a whole were not up to the level of last year, and those made called for delivery late in the summer. Mine prices, which were advanced May 1, were as follows: Black Creek lump, $3.50@$3.75; Cahaba lump, $3.20@$3.95; nut, $2.25@$2.90; Corona lump and egg, $2.65; nut, $2.35; Carbon Hill lump and egg, $2.10; nut, $1.80@$2.10; Big Seam lump and egg, $1.85; nut, $1.75; Aldrich lump and egg, $4.95; nut, $2.90; Dogwood lump, $4.70; Straven lump, $3.95; nut, $2.65.

There was no material change in the steam market as compared with March, with the possible exception of a lighter movement. Production was maintained on the basis of actual requirements, with little surplus coal. Coking coal consumption was good, but bunker inquiries were nil. Steam prices for the month were: Mine-run, $1.60; washed, $1.50 @$2.25; and screenings, $1.25@$1.50.

CONDITIONS in the New York market departed little from the normal for the month. Sales declined some from the winter level, but compared favorably with the April average. Stocks carried over were the lightest in several years, so that demand and consumption were evenly matched. Slack, both high- and low-volatile, occupied a strong position throughout the month. Prices on mine-run from the Northern fields were little changed from the March level. Many contracts were renewed during the month but some buyers who usually sign up at that time delayed doing so to get a better line on their probable requirements during the later months of 1930.

The Philadelphia market was quiet over the month of April, though there was a slight, but not satisfactory, increase in tonnage moved. Prospects of business revival had little effect on soft-coal business.

Light domestic demand in the first part of April was the feature of the New York anthracite market, resulting from a policy of waiting for the spring price reductions on the part of the buyers. But some of the heaviest buying since last fall set in with a cut of 60c. on egg, stove, chestnut and pea, effective April 22. Stocks were generally depleted, and several days of unseasonable weather started coal moving from the retail yards at a rate that made immediate replenishment necessary. Steam sizes were strong over the entire month. There was a serious shortage of buckwheat and a more moderate one in rice and barley, due to curtailment in production.

QUIET pervaded the anthracite trade in Philadelphia until cold weather at the last of the month stimulated household buying. At the first of the month, retailers had practically ceased buying in anticipation of price reductions. These were announced on April 21, effective immediately, and caused a material increase in the tonnage moved. The dealer discount in force last year was apparently discarded.

Exports of coal in the month of March, the latest month for which figures are available, were as follows: Bituminous, 726,284 gross tons, as compared to 879,084 gross tons in the same month last year; anthracite, 148,540 gross tons, against 155,472 gross tons in March, 1929. Imports in March, 1930 and 1929, were 17,901 and 40,653 gross tons of bituminous coal, respectively, and 54,644 and 29,414 gross tons of anthracite, respectively.

Current Quotations—Spot Prices, Bituminous Coal—Net Tons, F.O.B. Mines

		Week Ended			
MIDDLE WEST	Market Quoted	April 5, 1930	April 12, 1920	April 19, 1930	April 26,1930
Franklin, Ill. lump	Chicago	$2.25	$2.25	$2.25	$2.25
Franklin, Ill. mine-run	Chicago	2.15	2.15	2.15	2.15
Franklin, Ill. screenings	Chicago	1.75	1.75	1.65@ 1.75	1.50@ 1.85
Central, Ill. lump	Chicago	1.75@ 1.90	1.75@ 1.90	1.75@ 1.90	1.75@ 1.90
Central, Ill. mine-run	Chicago	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75
Central, Ill. screenings	Chicago	1.25@ 1.60	1.25@ 1.60	1.25@ 1.60	1.25@ 1.60
Ind. 4th Vein lump	Chicago	2.40@ 2.50	2.40@ 2.50	2.40@ 2.50	2.40@ 2.50
Ind 4th Vein mine-run	Chicago	1.50@ 2.10	1.50@ 2.10	1.50@ 2.10	1.50@ 2.10
Ind. 4th Vein screenings	Chicago	1.40@ 1.60	1.40@ 1.60	1.40@ 1.60	1.25@ 1.50
Ind. 5th Vein lump	Chicago	2.00@ 2.20	2.00@ 2.20	2.00@ 2.20	2.00@ 2.20
Ind. 5th Vein mine-run	Chicago	1.30@ 1.65	1.30@ 1.65	1.30@ 1.65	1.30@ 1.65
Ind. 5th Vein screenings	Chicago	.90@ 1.10	.90@ 1.10	.90@ 1.10	.80@ 1.00
Mount Olive lump	St. Louis	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00
Mount Olive mine-run	St. Louis	1.65	1.65	1.65	1.65
Mount Olive screenings	St. Louis	1.35@ 1.45	1.35@ 1.45	1.35@ 1.45	1.35@ 1.45
Standard lump	St. Louis	1.65@ 1.75	1.65@ 1.75	1.65@ 1.75	1.65@ 1.75
Standard mine-run	St. Louis	1.50	1.50	1.50	1.50
Standard screenings	St. Louis	1.25@ 1.35	1.15@ 1.35	1.15@ 1.35	1.15@ 1.35
West Ky. lump	Louisville	1.25@ 1.65	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50
West Ky. mine-run	Louisville	.85@ 1.25	.90@ 1.25	.95@ 1.25	1.00@ 1.35
West Ky. screenings	Louisville	1.00@ 1.10	1.00@ 1.10	.90@ 1.00	.95@ 1.10
West Ky. lump	Chicago	1.30@ 1.40	1.30@ 1.40	1.30@ 1.40	1.25@ 1.35
West Ky. mine-run	Chicago	.85@ 1.15	.85@ 1.15	.85@ 1.15	.85@ 1.30
SOUTH AND SOUTHWEST					
Big Seam lump	Birmingham	$1.85	$1.85	$1.85	$1.85
Big Seam mine-run	Birmingham	1.50@ 1.75	1.50@ 1.75	1.50@ 1.75	1.50@ 1.75
Big Seam (washed)	Birmingham				
S. E. Ky. block	Chicago	1.90@ 2.00	1.90@ 2.00	1.90@ 2.00	1.90@ 2.00
S. E. Ky. mine-run	Chicago	1.25@ 1.60	1.25@ 1.60	1.25@ 1.60	1.25@ 1.60
S. E. Ky. block	Louisville	1.75@ 2.25	1.75@ 2.25	1.75@ 2.25	1.75@ 2.25
S. E. Ky. mine-run	Louisville	1.25@ 1.60	1.25@ 1.50	1.25@ 1.50	1.25@ 1.60
S. E. Ky. screenings	Louisville	1.00@ 1.25	1.10@ 1.25	1.15@ 1.35	1.10@ 1.25
S. E. Ky. block	Cincinnati	1.75@ 2.75	1.65@ 2.75	1.65@ 2.75	1.60@ 2.75
S. E. Ky. mine-run	Cincinnati	1.15@ 1.50	1.15@ 1.60	1.15@ 1.60	1.15@ 1.60
S. E. Ky. screenings	Cincinnati	.85@ 1.10	.75@ 1.00	.85@ 1.00	1.00@ 1.15
Kansas shaft lump	Kansas City	3.50@ 3.75	3.50@ 3.75	3.50@ 3.75	3.50@ 3.75
Kansas strip lump	Kansas City	2.50@ 3.00	2.50@ 3.00	2.50@ 3.00	2.50@ 3.00
Kansas mine-run	Kansas City	2.50	2.50	2.50	2.50
Kansas crushed mine-run	Kansas City	1.85	1.85	1.85	1.85
Kansas screenings	Kansas City	1.85	1.85	1.85	1.85

WORD from the FIELD

Miners' Union Fight Continues In Kansas and Illinois

Following the split between the regular and insurgent groups of the United Mine Workers, which took place in March, both sides settled down to a campaign for membership in the month just past. Efforts were chiefly centered in Kansas, where the provisional government appointed by John L. Lewis, president, United Mine Workers, is attempting to gain control of the organization headed by Alexander Howat before his election to the presidency of the insurgents, and in Illinois, where both insurgents and regulars are attempting to hold their ground and register a gain at the expense of their enemies.

Operators in the Kansas-Missouri field went into action in support of Lewis on April 12, withholding the "check-off" from all but nine local unions under instructions from W. L. A. Johnson, commissioner, Southwest Interstate Coal Operators' Association. On the preceding Thursday, insurgent leaders announced that in a referendum vote taken in the district, the miners voted 1,700 to 40 in favor of sending national dues to the Howat organization at Springfield, Ill., instead of to the Lewis faction at Indianapolis, Ind.

Antedating the action of the Kansas-Missouri operators by a few weeks, Eugene McAuliffe, president, Union Pacific Coal Co., Rock Springs, Wyo., announced on April 3 that the Union Pacific contract with the United Mine Workers would be carried out and that the company "will not under any circumstances recognize the Springfield organization" nor "collect a single dollar for it." Mr. McAuliffe further stated that the Union Pacific would pick its own union in case the United Mine Workers passed out by reason of internal differences, and that it would not be the I. W. W., the National Miners' Union, or the dual organization headed by Howat.

Alleged violation of the terms of a temporary injunction obtained last October by the officers of District 12 (Illinois) prohibiting the Lewis faction from interfering in the affairs of the district, resulted in the issuance of summonses on April 17 for Lewis and 32 of his aides by Circuit Judge Frank W. Burton, Springfield, Ill. The labor leaders were directed to show cause why they should not be attached and held in contempt of court for attempting to set up a provisional government in violation of the terms of the injunction. In reply, the Lewis faction contended that the formation of the insurgent union had altered the conditions upon which the injunction was based. Hearing of the issues was scheduled for April 30.

Missionary work on the part of the insurgents resulted in a clash at Royalton, Ill., on April 18, in which a constable and five miners were wounded. The trouble arose when Howat and Adolph Germer got out of an automobile to address a meeting. Ray Edmondson, Zeigler, Ill., it is charged, attempted to prevent Howat and Germer from holding the meeting, and incited the riot when the labor leaders refused to listen to his demands. Germer was beaten up in the affray, but was able to address the meeting after the trouble quieted down.

In the anthracite region, where negotiations on a new wage contract started on April 30, President Lewis in a speech before the union conference expressed the hope that the present wage scale would be renewed to prevent a strike that would have a serious effect on the hard-coal region. An agreement between the strip operators of Indiana and the miners was signed in April, carrying a rate of $6.10 a day. In central Pennsylvania, an agreement between a few operators and the miners also was signed last month. The scale, which affects about 1,000 men, is as follows: motormen, $5.25; brakemen, wiremen, tracklayers, trip riders, drivers, timbermen and brattice men, $5.15; trappers, $3; pick mining 0.9306c. per gross ton, and machine loading, 0.5961c. per gross ton. The scale was signed by H. B. Stemper, Juniata Coal Co.; John S. Foreman, Shoemaker Coal Co.; W. L. Piper, W. H. Piper Coal Co., and R. H. Moore, C. A. Hughes & Co.

Wakenva Company to be Sold

Holding of the Wakenva Coal Co., a part of the Amalgamated Coal Corporation, which went into the hands of receivers in September, 1929, will be sold at auction May 19, at Lebanon, Va. A number of mines and several thousand acres of coal land in southwest Virginia, with an aggregate value said to be over $2,000,000, will be disposed of at that time.

Attack Freight Rates on Coal To South Atlantic Ports

Freight rates on coal to South Atlantic ports have been brought in issue by a complaint filed with the Interstate Commerce Commission by the Traffic Association of the South Atlantic Ports. It is charged that the present rates from the Clinchfield, New River, Windrock, Jellico, Bessemer, Birmingham, Pocahontas, Coal Creek, Appalachia, Deep Water, Tug River, Thacker, Kenova, Kanawha, and other fields to Wilmington, Charleston, Savannah, Brunswick, and Jacksonville are unreasonable *per se* and in relation to rates to Norfolk, Atlanta, Memphis, and Nashville. In a separate complaint, the Corporation Commission of North Carolina charges that the rates on coal to North Carolina points are unreasonably high, as compared to rates to other destinations in Southern classification territory.

Exclusion of Soviet Anthracite Receives Setback

Attempts to place an embargo on the importations of Soviet anthracite received a setback on April 23, when the Joint Conference Committee of the House and Senate adopted the Senate version of Section 307 of the tariff bill without making any of the changes advocated by anthracite operators and Pennsylvania Congressmen from the anthracite region, thereby closing one avenue to the exclusion of imports. Section 307 prohibits the entry of all products mined or manufactured by forced labor after Jan. 1, 1932. The conferees added a clause to the provision to make it apply only to goods competing with American products. Pennsylvania members of Congress sought to change the provision either by eliminating the effective date or making it immediately operative in the case of anthracite.

It now appears that any exclusion of the Soviet product must be accomplished by executive order, through that section of the tariff law authorizing the President to place an embargo upon any product imported, or produced abroad, under unfair competitive conditions. A decision of the U. S. Court of Customs Appeals, April 10, affirmed the authority of the President to bar completely any products produced under conditions unfair to American goods.

Utilization of Midwest Coal for Domestic Fuel Emphasized at Purdue Conference

PRODUCERS, distributors, equipment manufacturers, and the consumers of Illinois and Indiana coals met at Purdue University, Lafayette, Ind., last month to discuss fuel problems of common interest. The occasion was the Midwest Bituminous Coal Conference, held April 9-11 under the auspices of Purdue, the Coal Trade Association of Indiana, and the Illinois Coal Bureau, with the University of Illinois and the Fuel Division of the A.S.M.E. co-operating.

The conference was the outgrowth of Indiana Fuel conferences held at Purdue in 1928 and 1929. The market situation, retail co-operation, and the effective utilization of Illinois and Indiana coal as a domestic fuel and in specific industries formed the framework of the program. Major emphasis, however, was placed upon the development of the small stoker for home heating. Many speakers emphasized the part the mechanization of coal burning in the home might play in the growing public demand for smokeless combustion.

On the basis of freight rates, declared Paul Richey, president, Indianapolis Chamber of Commerce, at the first session of the conference, Illinois and Indiana coals should be the first economic choice of every consumer in Indiana, southern Michigan, Illinois, Wisconsin, Iowa, Missouri, Minnesota, Nebraska, Kansas, and the Dakotas. Instead of dominating this market, however, Illinois and Indiana shipments had fallen from 50.57 per cent of the total consumed in that market area in 1923 to 33.87 per cent in 1928.

Post-war declines in tonnage, said C. G. Ferris, executive vice-president, Illinois Chamber of Commerce, could be attributed to public resentment of union labor policies, growth of central-station service with the abandonment of inefficient private plants, and the increased use of gas and coke. There always will be a limited demand for gas, coke, anthracite, and high-grade Eastern bituminous, but Midwest producers and their allies are now in a position to challenge successfully their more recent competitors for first place "as purveyors of adequate and less expensive power and heat."

A critical note was sounded by Alex. D. Bailey, superintendent of generating stations, Commonwealth Edison Co., Chicago, who asserted that Midwestern coals had not proved an economic success as far as large consumers are concerned. Users of these coals are paying millions in freight on ash, moisture, and sulphur. His company spent $2,000,000 in five years to fight the corrosive effects of sulphur in Midwest coal. He claimed that there was less clean coal in Illinois and Indiana at the present time than was offered ten years ago and warned the operators that "it was up to them to do something."

C. L. Brewer, chief engineer, Van Camp Packing Co., Indianapolis, Ind., countered with the declaration that in 1926, using Indiana coal mined under the Jacksonville wage scale, he had produced 290,347,000 lb. of steam at a coal cost of 16.11c. per 1,000 lb. of steam generated. In 1928, using Eastern coal, the coal cost was 19.06c. For nine months in 1929, again using Indiana coal, the coal cost dropped to 13.13c., representing a saving of $14,760 in the fuel bill. Illinois and Indiana coals, said W. D. Langtry, president, Commercial Testing & Engineering Co., Chicago, "are being used successfully and satisfactorily in practically every kind of industry in which coal is consumed."

AN EXTENDED analysis of equipment and fuel considerations in domestic heating was presented by C. H. B. Hotchkiss, associate professor, heating and ventilating, Purdue. In large detached residences valued at more than $25,000, he found coal cost secondary and comfort and convenience the first consideration. In residences valued at $7,500 to $25,000, cost ranked with comfort; in homes valued at less than $7,500, cost was the controlling factor.

The application of Illinois and Indiana coals to specific industries was the subject of an evening session on April 9. Use of Midwest coal in ceramics was treated by Professors C. W. Parmelee and R. K. Hursh, University of Illinois; glass manufacture with Illinois and Indiana coal was discussed by O. T. Boes, purchasing agent, Turner Glass Corporation, Terre Haute, Ind.; and O. L. Scales, sales manager, George A. Enos Coal Co., Indianapolis, analyzed the utilization of Indiana coal in gas-producer practice.

Manufacturers of domestic-heating equipment had their innings at the first session April 10. Following a frank review of the problems and difficulties facing the small-stoker field by T. A. Marsh, consulting engineer, Combustion Engineering Corporation, in the course of which he expressed the belief that "heating-stoker designs are in their infancy," talks were made by W. D. Burton, chief engineer, Combustioneer, Inc.; Elmer J. Lowery, district sales manager, Chicago, Iron Fireman Manufacturing Co.; J. R. Sherwood, superintendent of service, Modern Coal Burner Co.; Joseph Harrington, president, Joseph Harrington Co.; and Lorin W. Smith, Jr., Minneapolis-Honeywell Regulator Co.

In the afternoon the place of the retailer in the picture was developed. B. R. Gebhart, public relations counsel, Illinois Coal Bureau, painted the ideal retailer as the fuel counselor of his community, but argued that the dealer must handle fewer kinds of coals and become more expert in his knowledge of the combustion of those he handles before he can assume that place. Milton E. Robinson, Jr., president, National Retail Coal Merchants' Association, hailed the fact that producers, distributors, equipment manufacturers, and consumers were meeting together as real evidence that the co-operative spirit was growing.

THE struggles of the manufacturers to put heating installations on a business basis through the establishment of standard codes were described by Harry M. Hart, Heating and Piping Contractors' National Association, originators of the "Certified Heat" plan, and Jack Stowell, National Warm Air Heating Association. How Kansas City (Mo.) coal men have organized to give the consumer who wants it complete heat service, including firing and ash removal, was outlined by George F. Klein, director of the Coal Service Institute of that city.

How long coal will remain an essential heating commodity depends largely upon the producers, declared Homer R. Linn, engineer, American Radiator Co., the principal speaker at an informal banquet which closed the second day's sessions. More research is needed, he said. There must be co-operation between small-stoker manufacturers and the coal industry, or situations will develop which will hurt both. Unless something is done to curb the number of stoker types put on the market, the stoker industry will duplicate the experience of the oil-burner industry, where at one time only 11 out of 157 burners met the specifications of the Underwriters' Laboratories.

"Reconditioning Existing Plants to Burn Illinois and Indiana Coals Economically and Smokelessly" was the theme of the final session of the conference, April 11. One practical way, in the opinion of Frank Chambers, chief inspector, smoke department, City of Chicago, was to limit permits for the installation of hand-fired furnaces to plants with a maximum capacity of 1,200 sq.ft. of direct steam radiation or 2,000 sq.ft. of hot-water radiation. He favored equipment to bring about smokeless combustion rather than arbitrary regulations governing the type of fuel to be used. Arbitrary regulations might defeat themselves.

"What is needed in the ultimate solution of this problem," said A. C. Willard and A. P. Kratz, department of mechanical engineering, University of Illinois, "is a less expensive fuel burned more efficiently with greater actual economy than before and at the same time providing for practically as much comfort and convenience as can be secured with any other fuel, whether fired manually or automatically." Underfeed stokers, they felt, best meet the demands. A description of the various types of industrial boilers and the changes necessary to effect smokeless combustion was presented in an illustrated talk by John Hunter, consulting engineer, St. Louis, Mo.

I. C. C. Asked to Dismiss Lake Cargo Complaint

Dismissal of the complaints of the Ohio and Pennsylvania operators in the lake cargo coal case has been asked of the Interstate Commerce Commission by the Chesapeake & Ohio Ry., Louisville & Nashville R.R., Norfolk & Western Ry., and Virginian Ry. The railroads allege that the complaints are insufficient in law and do not set up a violation of section 3 because they affirmatively show that the rates alleged to be unduly preferential are in every instance higher than the rates from districts from which the Northern operators ship lake cargo coal, and that there is no showing of injury to the Northern districts by reason of higher rates from the Southern fields.

Southern carriers also asserted that the Northern operators are seeking to have the Commission equalize industrial conditions, for which the railroads' rate adjustment is not responsible. Also, since the carriers which control the rate adjustments from the Southern fields (which are alleged to be preferred) are not the same as those controlling rates from the Northern fields, it is asserted that "there is no legal basis upon these facts for a finding of undue prejudice or undue preference in violation of section 3 of said act."

In reply, Northern operators stated that the motion to dismiss their complaints was frivolous and dilatory and asked the Commission to deny the motion and insist upon an immediate answer from the railroads. In addition, they denied that they are not prejudiced by existing lake cargo rates, asserted that the Commission has dealt with these rates on a third section basis and cited cases in support of their contention. They further stated that they relied upon a late decision of the Commission in the Galveston case (160 I. C. C. 345) as additional authority and warrant for the allegation of undue prejudice and undue preference.

Southern operators at a meeting in Washington, D. C., April 11, decided to intervene in the case and appointed J. V. Norman, Louisville, Ky., veteran of many lake cargo battles, as chief counsel. Robert L. Quirk, Washington, D. C., and E. L. Greever, of Virginia, will be Mr. Norman's associates.

—❖—

Gilbert-Davis Coal Co. In Receivership

Proceedings brought by the Bank of the Monongahela Valley for the appointment of an operating receiver were forestalled by the Gilbert-Davis Coal Co., Morgantown, W. Va., when it filed a voluntary petition in bankruptcy in the federal court at Elkins, W. Va. W. T. Hughes was appointed temporary receiver to supervise and conserve the company's assets. The Gilbert-Davis company has operated in the Scotts Run field in northern West Virginia for a number of years.

Robert M. Lambie

Lambie Elected President Of Mine Chiefs' Group

The Mine Chiefs' Association of America was formed April 22 at a meeting at the Pittsburgh station of the U. S. Bureau of Mines, to further the cause of mine safety in the United States. Mine chiefs of the seventeen mining states will compose the membership. Officers of the association are as follows: President, Robert M. Lambie, chief, West Virginia Department of Mines, Charleston, W. Va.; vice-president, Walter Glasgow, Secretary of Mines for Pennsylvania, Harrisburg, Pa.; secretary-treasurer, J. J. Rutledge, chief engineer, Maryland Bureau of Mines, Baltimore, Md. E. W. Smith, chief, Division of Mines of Ohio, Columbus, Ohio, and John Millhouse, director, Illinois Department of Mines and Minerals, Springfield, Ill., were chosen to serve with the three officers as members of the board of directors.

—❖—

National Safety Council Codifies State Safety Laws

Safe practices pamphlet No. 4, "State Safety Requirements in Industry," published by the National Safety Council, Chicago, enables employers to quickly obtain publications of the various states bearing on the regulations enforced by them. For this purpose, the pamphlet is divided into two sections: a subject chart and a publication list. The subject chart includes an alphabetical list of the 84 common subjects regulated by the various states, and is used to determine what states have safety requirements; which of the subjects on which a given state has safety requirements, and whether a given state has safety requirements on a given subject. Code numbers given in the chart refer to a supplementary publication list, arranged alphabetically by states, to enable the reader to determine the title of the state publications in which requirements on any given subject may be found.

International Safety Meet Goes to Louisville

The Ninth International First-Aid and Mine Rescue Contest will be held at Louisville, Ky., Sept. 16-18. Approval of the dates and place of holding the meet has been granted by Scott Turner, director, U. S. Bureau of Mines, and president, Joseph A. Holmes Safety Association, the two bodies sponsoring the contest. Co-operating are the National Safety Council, American Red Cross, and various operators' associations and miners' organizations.

First-aid teams will be required to perform certain definite problems in first-aid practice calling for the treatment of injuries and the proper handling of the patient. Mine-rescue teams, each equipped with oxygen breathing apparatus, will work out practical problems such as are likely to be encountered in underground rescue and fire-fighting operations. Employees of coal and metal mines, quarries and metallurgical plants, and workers in the oil and gas industries are eligible for participation. An unusual feature of the meet will be an extensive manufacturers' exhibit of permissible mining equipment and mine safety devices tested and approved by the Bureau of Mines.

—❖—

Mine Rescue Association To Meet at Scranton

Three hundred men who have taken part in the rescue and recovery work following mine fires and explosions are expected to attend the spring meeting of the National Mine Rescue Association, to be held in the evening of May 24 at the Hotel Casey, Scranton, Pa. This is the first meeting of the kind to be held in the anthracite region, and a large representation from western Pennsylvania and West Virginia is expected to attend. Papers to be read at the meeting will deal with the organization and procedure to follow during mine fires and explosions, as well as the subject of their prevention.

—❖—

New Plant Construction

New contracts for topworks and construction under way or completed at various coal operations reported for the month of April are as follows:

Gauley Mountain Coal Co., Jodie, W. Va.; contract closed with the Kanawha Manufacturing Co. for all-steel tipple equipped with shaker screens, picking tables, loading booms, and 200-ton steel slack bin; capacity, 200 tons per hour.

National Fuel Co., National, W. Va.; contract closed with the Fairmont Mining Machinery Co. for complete four-track tipple equipped with shaker screens, picking tables, and loading booms; capacity, 250 tons per hour.

Reppert Coal Co., Flemington, W. Va.; contract closed with the Morrow Manufacturing Co. for four-track tipple complete with shaker screens, picking tables, loading booms, and rescreen conveyor; capacity, 150 tons per hour.

Sunday Creek Coal Co., Millfield, Ohio; contract closed with the Morrow Manufacturing Co. for four-track tipple complete with shaker screens, picking tables, loading booms, rescreen and refuse conveyors; capacity, 400 tons per hour.

What's Ahead for American Business Chamber of Commerce Theme

BUSINESS, as evidenced by the attitude of delegates to the Eighteenth Annual Meeting of the Chamber of Commerce of the United States, held in Washington, D. C., April 28–May 1, is less inclined than ever to accept passively the changing trends which affect it and shows more inclination to come to grips with the difficulties that lie in its course. From the building up of machinery for production and distribution, it is shifting its attention to the problem of operating it more smoothly and efficiently. The theme of the general sessions and the auxiliary meetings was not how much is to be done, but how effectively.

Fluctuations in economic activities were not regarded as inevitable happenings to which business must adjust itself but as something which the exercise of foresight and judgment would prevent entirely, along with the attendant evils of unemployment and stagnation. Developing business methods were brought under careful scrutiny, and business more dispassionately than ever before weighed its qualifications for doing the tasks before it.

ON THE eve of the meeting, the National Business Conference Survey, formed last year to relieve the effects of the business depression following the stock-market crash, issued a summary of business conditions at the present time. Principal points brought out in the summary are as follows: American industry is fully carrying out the construction program forecast last December; manifest adjustment of production of goods to current consumption is in evidence; prudent merchandising policies continue to govern retail distribution, and evidence of trade disturbances in other countries.

"What's ahead for business" was the theme of numerous round-table conferences, which took up a large part of the time allotted the convention. At the meeting devoted to the natural resources industries, held on April 29, representatives of the coal, oil, lumber, and water-power industries discussed regulation of production as a means of improving the unfavorable situation in which they find themselves. W. L. Robison, vice-president, Youghiogheny & Ohio Coal Co., Cleveland, Ohio, said that "the present great difficulty" confronting the coal industry is "an excess of capacity to produce. This situation can be met in only one of two ways: either by checking the growth of mine capacity and even reducing the existing capacity or by expanding the field of coal utilization." "Survival of the fittest" is one way of accomplishing restriction of capacity, though a happier method lies in "the consolidation of coal companies, or mergers, on a large scale." Scientific research, Mr. Robison asserted, "alone can discover ways of enlarging the field of utilization of coal and its byproducts."

Roderick Stephens, president, Stephens Coal Co., New York City, asserted that one of the present tasks of the industry is to repel efforts of the United Mine Workers to saddle it with legislation for the stabilization of employment, despite the manifest excess of productive capacity now in existence. Turning to the subject of trade-practice agreements, he remarked that certain producing units are adopting such rules in the belief that they may accomplish something the anti-trust laws forbid. Such efforts he termed "a lot of bunk." Creation of a new viewpoint on competition was his conception of the most pressing problem of the industry, as well as the development of strong disposition for self-government.

"Group thinking and group action are evolutions in business," said Christie Benet, general counsel, National Cottonseed Products Association, Columbia, S. C., in opening the round-table conference on the future of the trade-practice movement. "In our opinion, in the trade-practice movement the steps must be constant and they must be lawful. We hold no brief for men who violate the law." Gilbert H. Montague, attorney at law, New York City, told the conferees that while the situation with respect to what may or what may not lawfully be done does not permit a "pontifical statement," it is possible to establish a code that will work efficiently and under which a business or an industry may carry on successfully.

THE Federal Trade Commission must be free to change its mind on the probable legality, in the light of court decisions, of such rules as it has approved, Arthur Fisher, Chicago attorney, told the meeting, but the industry should have some assurance that it can act upon the commissioner's ruling as long as they are in effect. There will always be a twilight zone between what is legal and what is illegal, because the anti-trust laws are based on general principles and the interpretations placed upon them by the courts lag far behind the progress of business.

Fred W. Swanson, commissioner, National Plumbing and Heating Institute, Chicago, declared that, in his experience, trade-practice codes and the procedure under them must have a top and bottom. "The top must explain and instruct, and the bottom must have contact with the individuals in the industry." The hope expressed by the conference as a whole was that before changing rules previously adopted and approved, the Commission would grant an open hearing.

Reassurance as to rumors of a hostile attitude on the part of the Department of Justice toward the trade-practice movement was contained in a talk made by John Lord O'Brian, assistant to the Attorney General of the United States, before a meeting of trade association executives on May 1. Mr. O'Brian denied that there was any lack of harmony between the Department of Justice and the Federal Trade Commission with respect to trade-practice work. He stated specifically that the department is concerned only with sporadic instances of price-fixing and other illegal activities which are not characteristic of the great body of trade associations.

Research Fellowships Offered

Five fellowships for research in coal and non-metallics, in co-operation with the U. S. Bureau of Mines, each paying $720 per year, are offered by the College of Mines, University of Washington. Among the problems are: utilization of coal; beneficiation of coal, and low-temperature carbonization.

Locomotive Shipments Fall

Shipments of mining and industrial electric locomotives for the quarter ended March 31, 1930, as reported to the Department of Commerce by nine firms, comprising practically the entire industry, were 140, valued at $968,157, as against 214 locomotives, valued at $1,251,729, for the quarter ended Dec. 31, 1929, and 207, valued at $1,248,071, for the quarter ended March 31, 1929. Export as well as domestic shipments are included in the totals.

	Grand Total		Mining Locomotives				Industrial Locomotives			
			Trolley Type		Storage-Battery Type		Trolley Type		Storage-Battery Type	
	Number	Value	Number	Value	Number	Value	Number	Value	Number	Value
1928										
Quarter ended:										
March 31	133	$728,629	81	$487,173	42	$109,998	1	$10,545	9	$120,913
June 30	111	729,458	68	333,648	30	88,845	6	148,937	7	158,028
Sept. 30	141	860,305	71	372,644	50	137,145	14	219,716	6	130,800
Dec. 31	184	1,149,678	104	524,303	65	181,823	11	416,887	4	26,665
Annual total	569	$3,468,070	324	$1,717,768	187	$517,811	32	$796,085	26	$436,406
1929										
Quarter ended:										
March 31	207	$1,248,071	124	$614,924	56	$174,945	22	$437,702	5	$20,500
June 30	188	1,121,162	90	536,356	83	234,731	10	148,697	5	201,378
Sept. 30	216	1,516,397	112	638,209	84	221,734	18	612,888	2	43,566
Dec. 31	214	1,251,729	142	930,737	65	174,883	6	144,389	1	1,720
Annual total	825	$5,137,359	468	$2,720,226	288	$806,293	56	$1,343,676	13	$267,164
1930										
Quarter ended:										
March 31	140	$968,157	84	$503,837	39	$138,559	7	$182,407	10	$143,354

Will Consider Revision of Cost Accounting Forms

The desirability of revising the cost accounting form designed some years ago by a special committee of the National Coal Association will be considered by a group of operators consisting of F. A. Fontyn (chairman), Ebensburg Coal Co.; A. K. Bowles, Consolidation Coal Co.; Erskine Ramsay, Alabama By-Products Corporation; P. C. Thomas, Koppers Coal Co.; Wm. P. Cayton, Rail & River Coal Co.; W. H. Koch, Hitchman Coal & Coke Co.; and B. H. Canon, Clinton Block Coal Co., under plans developed by the Market Research Institute of the association.

What changes, if any, should be made in the forms as they now exist, with special attention as to whether special forms should be prepared in connection with stripping operations, will be discussed at a meeting of the committee to be held early in May. The committee also will take up the question of the advisability of preparing two sets of forms—one adaptable as to the number of details to meet the demands of large companies, and another with fewer items separated for the use of smaller companies.

Railroad Fuel Costs Decline

A decline in the quantity and average cost of coal used by Class 1 railroads in locomotives in yard switching and road train service was registered during the month of February, 1930, as compared to the same month in 1929. Consumption and average cost per ton, including the cost of labor and supplies incidental to handling the coal, are shown in the following table, compiled by the National Coal Association.

Bituminous coal handled as originating tonnage by Class 1 railroads in 1929, according to figures compiled by the National Coal Association, was 368,328,132 net tons, for which the total revenue received was $827,203,775. The quantity of coal used by locomotives on Class 1 roads in road train and switching service was 112,945,125 net tons. Average cost of the coal was $2.40 per ton, including direct freight charges, and $2.01 excluding freight charges. Cost of labor and supplies incidental to handling the coal is included in the averages.

Operating statistics of the Class 1 carriers show that the roads required an average of 125 lb. of coal per thousand gross ton miles of freight handled (including locomotive and tender) in 1929, as compared to 127 lb. in 1928.

Railroad Fuel Costs, February, 1930 and 1929

	1930			1929		
		Average Cost per Ton			Average Cost per Ton	
	Consumption, Net Tons	Including Direct Freight Charges	Excluding Direct Freight Charges	Consumption, Net Tons	Including Direct Freight Charges	Excluding Direct Freight Charges
Eastern district	4,231,492	$2.41	$1.84	4,769,768	$2.47	$1.88
Southern district	1,914,082	1.99	1.65	2,181,184	2.03	1.72
Western district	2,427,317	2.52	2.36	3,026,010	2.62	2.46
United States	8,572,891	$2.35	$1.94	9,976,962	$2.42	$2.02

W. D. Brennan

Utah Operators Elect

At the annual meeting of the Utah Coal Producers' Association, held at Salt Lake City, Utah, April 17, the following officers were elected: president, W. D. Brennan, president, Utah Fuel Co., Salt Lake City; vice-president, L. R. Weber, vice-president, Liberty Fuel Co., Salt Lake City, and secretary, Oliver J. Grimes (re-elected). The new executive committee consists of W. D. Brennan; L. R. Weber; Thomas Stockett, general manager, Spring Canyon Coal Co. and Royal Coal Co.; F. A. Sweet, president, Standard Coal Co.; J. B. Marks, general manager, Independent Coal & Coke Co.; and H. L. Pascoe, general manager, Blue Blaze Coal Co., all of Salt Lake City, Utah.

Colorado Development Planned

Construction of a standard-gage railroad to tap coal fields near Meeker, Colo., will be started within a short time, according to plans announced by S. B. King, Yankton, S. D., vice-president of the Yankton, Norfolk & Southern R.R. The new trackage, 44 miles in length, will connect with the Denver & Rio Grande Western at Rifle, Colo., and will be the first railroad to the Meeker section. Mr. King and his associates are said to have obtained an option on 4,000 acres of coal land at Meeker, containing 1,360,000 tons of bituminous coal lying in upright strata, each from 14 to 67 ft. wide and extending to the surface. The new coal company, which it is reported will be incorporated in Colorado, plans to produce 5,000 tons per year by stripping methods.

Personal Notes

HARRY L. GANDY, who recently resigned as executive secretary of the National Coal Association to accept the vice-presidency of Pattison & Bowns, Inc., has retired from the latter position to become president of Fuel Supplies, Inc. According to an announcement by Michael Gallagher, president of the Pittston Co., the parent organization, Mr. Gandy's latest appointment became effective May 1. Fuel Supplies, Inc., is a holding company controlling a number of retail coal companies handling both anthracite and bituminous coal. The New York office of the Pittston Co. has been moved from 30 Church St. to the Whitehall Building, where the offices of Fuel Supplies, Inc., also are located.

A. E. YETTER, general superintendent of the Hudson Coal Co. for a number of years, and lately special engineer for the Glen Alden Coal Co., has been made superintendent of the Glen Alden northern division collieries.

HOMER F. MCDONALD, president, Meteor Coal Co., St. Louis, Mo., has been appointed assistant to the president of the Bell & Zoller Coal & Mining Co. at Chicago.

Obituary

JOHN MUNROE, 72, veteran Nova Scotia mining man and a member of the staff of the chief mine inspector at the time of his retirement three years ago, died at his home at Dominion, N. S., April 20.

Coming Meetings

Western Canada Fuel Association; annual meeting, May 19-20, Hotel Saskatchewan, Regina, Sask., Canada.

Rocky Mountain Coal Mining Institute; summer meeting, May 26-28, Cosmopolitan Hotel, Denver, Colo.

National Retail Coal Merchants' Association; June 5-7, at Asbury Park, N. J.

Illinois Mining Institute; annual summer meeting, aboard the "Cape Girardeau," leaving St. Louis, Mo., June 6 at 10 p.m.

Indiana Coal Producers' Association; annual meeting, June 6, at Terre Haute, Ind.

Second World Power Conference; June 16-25, Berlin, Germany.

Colorado and New Mexico Coal Operators' Association; annual meeting, June 18, at Boston Building, Denver, Colo.

American Society for Testing Materials; annual meeting, June 23-27, at Haddon Hall, Atlantic City, N. J.

American Institute of Electrical Engineers; annual meeting, June 23-27, at Toronto, Canada.

Coal Division of the American Institute of Mining and Metallurgical Engineers, Sept. 11-13, at the William Penn Hotel, Pittsburgh, Pa.

International First-Aid and Mine Rescue Contest, Sept. 16-18 at Jefferson County Armory, Louisville, Ky.

National Safety Council; annual Safety Congress, Sept. 29 to Oct. 4, inclusive, at Pittsburgh, Pa.

Work Begins on P. & R. Breaker At St. Nicholas

Excavation and grading for the new central breaker of the Philadelphia & Reading Coal & Iron Co., at St. Nicholas, Pa., have been started by the Edwin T. Savage Co., Philadelphia, Pa., which has a sub-contract under the Stone & Webster organization. St. Nicholas breaker will be the second of the new central preparation plants built by the Reading company, the Locust Summit plant having started up April 2. Like the Locust Summit breaker, the St. Nicholas plant will cost approximately $4,000,000.

Short Course in Coal Mining Starts in June

The eighteenth annual short course in coal mining of the School of Mines, West Virginia University, will be given in June and July. Classes will be held June 9–July 19 at Morgantown, W. Va., and June 2–July 12, at Mt. Hope, W. Va. All phases of coal mining, including safety and engineering, will be taken up in the six weeks course of study, which is primarily designed to help mining men obtain foremen's certificates and to give men with certificates a more thorough knowledge of mining. The State Department of Mines will hold examinations for mine foremen's and firebosses' certificates upon completion of the courses at Mt. Hope and Morgantown.

Financial Reports Issued

Clinchfield Coal Corporation reports a net loss of $216,805 for the year 1929, after charges, depreciation, depletion, and preferred stock sinking fund requirements. This compares with a net loss of $285,760 in 1928.

Virginia Iron, Coal & Coke Co. reports for the quarter ended March 31 a net loss of $41,543 after interest, depreciation, depletion, and other charges, compared to a net profit of $33,048 in the first quarter of 1929.

Colorado Fuel & Iron Co. and subsidiary companies report for the quarter ended March 31 a net profit of $1,294,158 after interest, depreciation, and depletion but before federal taxes and deduction for equipment dismantled. This compares with a net profit of $939,983 for the same quarter in 1929.

Hillcrest Collieries (Canada) reports a net profit of $99,105 for the year 1929, against $102,529 in 1928.

Dominion Coal Co. (Canada) reports for the year 1929 a net profit of $200,000 after depreciation, sinking fund requirements, and interest charges, which compares with a net loss of $303,184 in 1928.

Pennsylvania Coal & Coke Corporation and subsidiaries report for the year 1929 a net profit of $109,420 after depreciation, depletion, and interest, against a loss of $519,807 in 1928.

Bureau of Mines Issues Permissible Plates

Two approvals of permissible equipment were issued by the U. S. Bureau of Mines during the month of March and three during April, as follows:

(1) Goodman Mfg. Co., Type 148-E power shovel; 22-hp. motor, 220 volts, d.c.; Approval 186; March 15.

(2) Bertrand P. Tracey Co., pit-car loader; 1-hp. motor, 250 volts, d.c.; Approval 187; March 19.

(3) Sullivan Machinery Co., Type CLU cutting-shearing machine; 50-hp. motor, 220-440 volts, a.c.; Approvals 188 and 188A; April 15.

(4) Sullivan Machinery Co., Type WK-22 compressor; 20-hp. motor, 230 volts, d.c.; Approval 189; April 22.

(5) Flood City Brass & Electric Co., room hoist; 5-hp. motor, 230 volts, d.c.; Approval 190; April 29.

Philadelphia & Reading Coal & Iron Co. and subsidiaries report a net profit of $630,007, after taxes, interest, depreciation, depletion and other charges, for the quarter ended March 31. This compares with a net loss of $43,905 in the first quarter of 1929.

Island Creek Coal Co. reports for the quarter ended March 31, a net profit of $589,625, as compared to $818,154 for the corresponding period in 1929.

M. A. Hanna Mines in Ohio Go to New Company

Bituminous coal-mining operations conducted by the M. A. Hanna Co., Cleveland, Ohio, through the Wheeling & Lake Erie Coal Mining Co., Massillon Coal Mining Co., and Jefferson Coal Co., were taken over by a newly formed subsidiary, the Hanna Coal Co., on May 1. In addition to conducting a general business by rail and lake, the Hanna Coal Co. will be exclusive sales agent for the mines it operates. It has affiliated with it dock facilities on both the upper and lower lakes.

Officers of the new company are: President, R. L. Ireland, Jr., and P. C. dents, R. L. Ireland, Jr., and P. C. Sprague; secretary, W. C. Scott, and treasurer, C. W. Brown. The operating personnel remains unchanged, as follows: general manager, Mr. Ireland; assistant general manager, R. V. Clay; chief engineer, R. C. Newman; mining engineer, John Richards; safety director, William Roy; purchasing agent, A. A. Mills; division superintendent, Wheeling & Lake Erie Coal Mining Co. and Massillon Coal Co., William Whelan; division superintendent, Jefferson Coal Co., William Simpson.

Eastern Railroads to Buy Fuel Direct From Operators

Eastern railroads, following a series of conferences between representatives of the International Railway Fuel Association and the National Coal Association beginning May 6, 1929, have adopted a plan whereby the purchase of railroad fuel coal may be kept within its proper field. The plan, which will affect purchases of 100,000,000 tons yearly, provides that: "in the purchase of all railroad fuel, direct contractual relations be had between the railroads and producers or recognized sales agents, who will furnish their authority for their quotations and place their orders direct with the producers," and "that the spread between maximum and minimum requirements in railroad coal contracts be reduced to a minimum."

Roads concurring in the plan are as follows: Akron, Canton & Youngstown; Ann Arbor; Baltimore & Ohio; Boston & Albany; Boston & Maine; Buffalo, Rochester & Pittsburgh; Canadian National; Central R.R. of N. J.; Chesapeake & Ohio; Chicago, Indianapolis & Louisville; Delaware & Hudson; Delaware, Lackawanna & Western; Detroit, Toledo & Ironton; Erie; Grand Trunk Railway System; Hocking Valley; Lehigh Valley; Louisville & Nashville; Maine Central; New York Central Lines; New York, Chicago & St. Louis; New York, New Haven & Hartford; New York, Ontario & Western; Norfolk & Western; Pennsylvania; Pere Marquette; Reading; Virginian Railway; Western Maryland, and Wheeling & Lake Erie. The plan also was accepted by the Wabash, Chicago & Eastern Illinois, Chicago & Alton, and Missouri Pacific, contingent upon like action by other Illinois roads.

Operators composing the group which carried on negotiations with the railroad executives were: C. E. Bockus, president, National Coal Association; T. B. Davis, president, Island Creek Coal Co.; C. F. Richardson, president, West Kentucky Coal Co.; Geo. B. Harrington, president, Chicago, Wilmington & Franklin Coal Co.; W. H. Cunningham, president, Truax-Traer Coal Co.; J. W. Searles, president, Pennsylvania Coal & Coke Co.; Wm. S. Bennet, Continental Coal Co.; R. H. Knode, president, Stonega Coke & Coal Co.; H. L. Findlay, vice-president, Youghiogheny & Ohio Coal Co.; Chas. A. Owen, president, Imperial Coal Corporation; Geo. J. Anderson, president, Consolidation Coal Co.; M. W. Stark, vice-president, Red Jacket Consolidated Coal & Coke Co.; R. C. Tway, president, R. C. Tway Coal Co.; James Bonnyman, president, Blue Diamond Coal Co., and Henry T. DeBardeleben, president, DeBardeleben Coal Corporation.

The railroad executives were: New York Central—P. E. Crowley, president, G. H. Ingalls, vice-president, and W. C. Bower, manager of purchases and stores; Pennsylvania — W. W. Atterbury, president, J. L. Eysmans and M. C. Kennedy, vice-

presidents, C. D. Young, general purchasing agent, and J. T. Carbine, assistant general traffic manager; Norfolk & Western—A. C. Needles, president, and W. J. Jenks and B. W. Harman, vice-presidents; Baltimore & Ohio—Daniel Willard, president, and H. A. Cochran, coal traffic manager; Chesapeake & Ohio—J. J. Bernet, president, and F. M. Whitaker, vice-president; Chicago, Burlington & Quincy—C. E. Spens, executive vice-president; Louisville & Nashville—W. R. Cole, president; Missouri Pacific—W. G. Vollmer, assistant to the president.

Illinois Institute Schedules Annual Boat Trip

The annual summer meeting and boat trip of the Illinois Mining Institute will be held June 6-8 on the steamer "Cape Girardeau," leaving from the foot of Vine Street in St. Louis, on the evening of June 6. Technical sessions will get under way in the morning of June 7. After an address of welcome by Prof. A. C. Callen, president, John G. Millhouse, director, Illinois Department of Mines and Minerals, will talk on "Mine Accidents in Illinois Mines." "Safety—Real or Synthetic," is the topic chosen by Dan Harrington, chief engineer, safety division, U. S. Bureau of Mines, Washington, D. C., who follows Mr. Millhouse on the program.

In the afternoon of the 7th, T. T. Brewster, president, Mt. Olive & Staunton Coal Co., will talk on "Mine Cost Accounting," and A. R. Joyce, vice-president, Joyce-Watkins Co., will discuss "Treated Timbers for Mines." Following Mr. Joyce, W. C. Argust, division superintendent, Peabody Coal Co., will speak on the subject of "Track-Cutting Machines." The final talk of the day, concluding the technical session, will be on the "Development of Mechanical Loading," by G. B. Southward, mechanization engineer, American Mining Congress. Delegates will return to St. Louis in the morning of June 9.

Nova Scotia Merger Planned

Reorganization of Nova Scotia's steel and coal industry into a single unit is embodied in a plan approved by the directors of the British Empire Steel Corporation, Ltd.; Dominion Iron & Steel Co., Ltd., and Dominion Steel Corporation, Ltd. Under the plan, which is to be approved by the stockholders, the ownership of the companies and their subsidiaries, situated mainly on Cape Breton Island, will pass to the Dominion Steel & Coal Corporation, which was organized for that specific purpose by act of the Nova Scotia Legislature in 1928. "Restoration of public confidence in a great national industry" and "establishment of improved financial conditions and creation of an acceptable means of financing that will render it possible to procure additional capital when required to improve existing plants and increase their earning power," are some of the objectives of the new combine.

Colorado Company Sold

Mining properties of the Hayden Brothers Coal Corporation, at Haybro, Colo., have been purchased by a group of financiers headed by George W. Harris, Denver, Colo., former president of the Colorado & Utah Coal Co. Production of the Hayden company mine in 1929 was 171,000 tons, and the property has an assessed valuation of $1,100,000. An extensive improvement program is planned by the purchasers.

Anthracite Shipments Fall

Anthracite shipments in March, 1930, as reported to the Anthracite Bureau of Information, Philadelphia, Pa., were 3,430,940 gross tons, a decrease of 1,277,767 tons from the total for February and of 197,751 tons from the total for March, 1929. Shipments for the coal year ending March 31, 1930, amounted to 57,838,837 tons, compared with 61,314,046 tons during the preceding coal year, or a decrease of 3,475,209 tons. Shipments by originating carriers for the month of March, 1930, as compared with the preceding month of February and with March, 1929, are as follows:

	March, 1930	Feb., 1930	March, 1929
Reading	749,522	1,011,368	676,295
Lehigh Valley	505,913	780,574	583,014
Central R.R. of New Jersey	309,466	440,059	308,049
Dela., Lack. & Western	589,196	675,923	626,825
Delaware & Hudson	437,805	628,402	489,840
Pennsylvania	368,474	450,950	345,147
Erie	246,439	385,057	375,165
N.Y., Ontario & West.	103,114	147,350	82,802
Lehigh & New England	121,011	189,024	141,554
	3,430,940	4,708,707	3,628,691

King Coal's Calendar for April

April 2—Indiana shaft operators and United Mine Workers sign wage agreement to run for one year. The scale retains the 1929 rate of $6.10 for day work and 91c. and 79c. for pick and machine mined coal, respectively.

April 3—Authorized representatives of 92 per cent of the bituminous coal production in Colorado and New Mexico, at a meeting held in Denver, Colo., adopt a code of fair trade practices, subject to the approval of the directorates of the companies involved.

April 3—Gas explosion at a mine at Elouges, near Mons, Belgium, causes death of thirteen miners and injuries to eight others.

April 3—British Coal Mines Bill passes third reading in the House of Commons by a vote of 277 to 234. A tory motion for rejection of the entire bill was rejected. The bill now goes to the House of Lords.

April 4—U. S. Court of Appeals for the Fifth Circuit decides, in the Roden Coal Co. case, that expenditures for items of coal-mine equipment necessary to maintain normal output may be charged to expense and are proper deductions from gross income for tax purposes.

April 4—Eugene McAuliffe, president, Union Pacific Coal Co., Rock Springs, Colo., announces that his company will continue under the working agreement with the United Mine Workers group headed by John L. Lewis and will not under any circumstances recognize the insurgent group headed by Alexander Howat, Springfield, Ill.

April 11—Southern operators, at a meeting in Washington, D. C., decide to intervene in the lake cargo coal case and appoint J. V. Norman, Louisville, Ky., chief counsel.

April 12—Coal operators in the Kansas-Missouri district go into action in support of the United Mine Workers headed by John L. Lewis by withholding the "check-off" from all but nine local unions in the district. Locals affected by this action are adherents of the insurgent group headed by Alexander Howat, Springfield, Ill.

April 12—Seventeen miners killed in an explosion in the mine of the Pacific Coast Coal Co., Carbonado, Wash. A committee investigating the blast ascribed the disaster to an overcharge of explosive, which resulted in a coal-dust blast.

April 14—Reorganization of the British Empire Steel Corporation, Ltd., Dominion Steel Corporation, Ltd., and Dominion Iron & Steel Co., Ltd., all operating on Cape Breton Island, Nova Scotia, into one unit, the Dominion Steel & Coal Corporation, approved by the directors of the companies involved. Stockholders are to pass on the plan.

April 17—John L. Lewis, president, United Mine Workers, and 32 of his aides cited by Circuit Judge Frank W. Burton, Springfield, Ill., to show cause why they should not be attached and held in contempt of court for attempting to set up a provisional government in District 12 (Illinois) in violation of the terms of a temporary injunction granted upon petition of the officers of the district last October.

April 18—Six men wounded in a shooting affray at Royalton, Ill., where Alexander Howat, president of the insurgent United Mine Workers, and Adolph Germer, vice-president of the organization, attempted to address a miners' meeting. Germer was beaten up by a crowd said to have been headed by Ray Edmondson, Zeigler, Ill., but was able to address the meeting after the trouble quieted down.

April 22—Mine Chiefs' Association of America formed at a meeting at the Pittsburgh station of the U. S. Bureau of Mines to further the cause mine safety in the United States. Mine chiefs of the seventeen mining states will compose the membership. Robert M. Lambie, chief, West Virginia Department of Mines, was elected president.

April 22—One man is killed and three others severely injured in an explosion of gas at the Bliss colliery of the Glen Alden Coal Co., Nanticoke, Pa.

April 23—Attempts to place an embargo on Soviet anthracite received a set-back when the Joint Conference Committee of the House and Senate adopted the Senate version of Section 307 of the tariff bill without any of the changes advocated by anthracite interests. Section 307 prohibits the entry of all products mined or manufactured by forced labor after Jan. 1, 1932, and the conferees added a clause to make the provision apply only to goods competing with American products. Pennsylvania members of Congress sought to change the provision either by eliminating the effective date entirely or making it immediately operative in the case of anthracite.

Anthracite Prices at New York, Effective April 22, 1930

(Per Gross Ton, F.O.B. Mines)

	Broken (Grate)	Egg (Furnace)	Stove	Chestnut	Pea	Buckwheat	Rice	Barley
Delaware, Lackawanna & Western Coal Co.	$8.00	$8.10	$8.60	$8.10	$4.40	$3.00*	$2.00	$1.50
Philadelphia and Reading Coal and Iron Co.	8.00	8.10	8.60	8.10	4.40	3.00	2.00	1.50
Lehigh Valley Coal Sales Co.	8.00	8.10	8.60	8.10	4.40	3.00	2.00	1.50
Lehigh Navigation Coal Co.	8.00	8.10	8.60	8.10	4.40	3.00	2.00	1.50
Hudson Coal Co.	8.00	8.10	8.60	8.10	4.40	....	....	....
M. A. Hanna Co.	8.00	8.10	8.60	8.10	4.40	....	....	....
Dickson & Eddy	....	8.10	8.60	8.10	4.40	3.00	....	....
Madeira Hill & Co.	8.00	8.10	8.60	8.10	4.40	....	....	....
Payne Coal Co.	....	8.10	8.60	8.10	4.40	....	....	....
General Coal Co.:								
Raven Run, Maryd, Westwood and Drifton	....	8.10	8.60	8.10	4.40	....	....	....
Hazel Brook and Upper Lehigh	....	8.35	8.85	8.35	4.65	....	....	....
Fuel Service Co.:								
Beaver Meadow	....	8.10	8.60	8.10	4.40	3.00	2.00	1.50
Kingston No. 2 and Gaylord	....	8.10	8.60	8.10	4.40	3.00	2.00	1.50
Kingston No. 4	....	8.35	8.85	8.35	4.65	3.00	2.00	1.50
Westwood	....	8.10	8.60	8.10	4.40	3.00	2.00	1.50
Jeddo	....	8.70	9.20	8.70	5.40	....	....	....
Highland	....	8.50	9.00	8.50	5.40	....	....	....

*Domestic buckwheat, $3.50.

Coal Development Planned For British Columbia

Purchase of the property of the Consumers Coal Co., Victoria, B. C., by the Canadian Coal & Iron Co., Vancouver, B. C., which recently bought and reopened the Morden mine near Nanaimo, is believed to foreshadow further large coal developments on Vancouver Island. Upon completion of the rehabilitation of the Morden mine, it is expected that 1,000 men will be employed, and steps are being taken to diamond-drill the Round Island coal property near Boat Harbor, B. C., acquired from the Consumers company, preparatory to development.

The Canadian company also has leased a waterfront site at Vancouver, where it will erect a bunkering plant, as well as facilities for the manufacture of briquets and other forms of fuel and the recovery of byproducts. Development of a market for slack coal is one of the primary objectives of the company.

Purchases May Be Expensed, Appellate Court Rules

An important victory for the coal industry in the long-drawn-out controversy with the Treasury Department as to the right to charge expenditures for items of coal-mine equipment necessary to maintain normal output to expense was won April 4, when the U. S. Court of Appeals for the Fifth Circuit decided, in the case of the Roden Coal Co., that such expenditures were proper deductions from gross income for tax purposes. The court held that Article 222, Regulations 45, permitting such deductions, was a reasonable and valid determination of the provisions of the Revenue Act of 1918 as applied to coal mines, and overruled the contention of the government that Article 222 was unwarranted by the law.

Contention of the government that the test of deductibility was whether the equipment had a useful life of more than one year was rejected by the Court, which said: "It is immaterial that the items involved have an actual life of more than one year." This holding is squarely contrary to a long line of decisions of the Board of Tax Appeals, which, following the case of the *Union Collieries Co.*, 3 B.T.A., 540, have held that the cost of items having a useful life of more than one year must be charged to capital and could not be deducted as expenses.

The present decision may well result in substantial refunds to companies where the purchase of equipment was only for the maintenance of production and did not decrease the cost, increase the output, or add to the capital value of the property, provided such companies have filed claims within the appropriate statutory period.

First-Aid Training Advances In Alabama

First-aid training in Alabama has taken on new life since the first of the year, according to a report made by the Alabama Mining Institute to the State Medical Association on April 15. The report showed that more men were trained in Alabama during the first three months of 1930 than during the entire year 1929. Men trained in 1929 numbered 2,158, while 2,761 men were trained in the first three months of 1930.

In the past six months, every man at ten mines of the DeBardeleben Coal Corporation, Alabama By-Products Corporation, Montevallo Coal Mining Co., Straven Coal Mining Co., and Republic Iron & Steel Co. has been trained in first aid. In addition to the above number, 63 men received training in advanced mine rescue work of a highly technical character. Certificates were issued by the U. S. Bureau of Mines and state authorities to all men trained.

Earnings and Employment Increase in February

Employment in coal mining — anthracite and bituminous combined — increased 1.5 per cent in February, as compared with January, while payroll totals increased 6.1 per cent, according to the monthly *Labor Review* of the U. S. Department of Labor. In anthracite mining in February, there was an increase of 4.7 per cent in employment, as compared with January, and an increase of 14.8 per cent in payroll totals. Employment in February, 1930, was 0.8 per cent greater than in February, 1929, while payroll totals were 0.5 per cent smaller.

Employment in bituminous coal mining decreased 0.1 per cent in February, as compared with January, while payroll totals increased 0.7 per cent, as shown by reports from 1,300 mines, in which there were in February 220,407 employees, whose combined earnings in one week were $5,494,266. Employment in February, 1930, was 4.9 per cent lower than in February, 1929, and payroll totals were 12.4 per cent smaller.

Employment and Payrolls in Identical Bituminous Coal Mines In January and February, 1930

	Mines	Number on Payroll — Jan., 1930	Number on Payroll — Feb., 1930	Number on Payroll — Per Cent Change	Amount of Payroll — Jan., 1930	Amount of Payroll — Feb., 1930	Amount of Payroll — Per Cent Change
Middle Atlantic	399	65,490	65,341	—0.2	$1,567,579	$1,567,269	.....
East North Central	183	31,621	32,195	+1.8	807,767	875,609	+8.4
West North Central	59	6,327	6,006	—5.1	157,935	161,770	+2.4
South Atlantic	312	52,900	52,631	—0.5	1,280,124	1,246,095	—2.7
East South Central	199	42,733	42,974	+0.6	935,384	939,702	+0.5
West South Central	28	2,968	2,984	+0.5	78,204	84,139	+7.6
Mountain	110	16,878	16,574	—1.8	570,409	556,455	—2.4
Pacific	10	1,662	1,702	+2.4	60,513	63,227	+4.5
All divisions	1,300	220,579	220,407	—0.1	$5,457,915	$5,494,266	+0.7

Per Cent Change in Each Line of Employment, January and February, 1930

	Establishments	Employment — Jan., 1930	Employment — Feb., 1930	Employment — Per Cent Change	Payroll in One Week — Jan., 1930	Payroll in One Week — Feb., 1930	Payroll in One Week — Per Cent Change
Manufacturing	12,619	3,227,517	3,239,024	+0.1[1]	$82,869,671	$86,548,702	+3.5[1]
Coal mining	1,452	325,208	329,942	+1.5	8,826,257	9,360,773	+6.1
Anthracite	152	104,629	109,535	+4.7	3,368,342	3,866,507	+14.8
Bituminous	1,300	220,579	220,407	—0.1	5,457,415	5,494,266	+0.7
Metalliferous mining	355	59,792	57,662	—3.6	1,743,731	1,740,077	—0.2
Quarrying and non-metallic mining	638	30,346	30,405	+0.2	728,051	743,862	+2.2
Public utilities	9,633	711,175	701,136	—1.4	21,297,708	20,946,554	—1.6
Trade	8,652	304,972	292,990	—3.9	7,785,422	7,538,128	—3.2
Wholesale	2,067	66,846	65,821	—1.5	2,077,293	2,041,940	—1.7
Retail	6,585	238,126	227,169	—4.6	5,708,129	5,496,188	—3.7
Hotels	1,754	149,983	151,866	+1.3	2,536,342[2]	2,616,016[2]	+3.1
Canning and preserving	412	18,923	18,746	—0.9	369,759	378,720	+2.4
Total	35,515	4,827,916	4,821,771	—0.1	$126,156,941	$129,872,832	+2.9

[1]Weighted per cent of change for the 54 manufacturing industries; remaining per cents of charge are unweighted. [2]Cash payments only.

Coal-Mine Fatality Rate for March, 1930, Increases Over Preceding Month

ACCIDENTS at coal mines in the United States during March, 1930, caused the death of 169 men, according to information furnished by state mine inspectors to the U. S. Bureau of Mines. Included in these accidents were 140 fatalities in bituminous mines in various states; the remaining 29 were in the anthracite mines of Pennsylvania. During the month, 35,773,000 tons of bituminous coal and 4,551,000 tons of anthracite coal was mined. Based on these figures, the death rates per million tons of coal produced were 3.91 for bituminous and 6.37 for anthracite, while for the industry as a whole the rate was 4.19. The rates for March of the preceding year were 3.86, based on 154 deaths and 39,870,000 tons for bituminous mines; 5.95, based on 30 deaths and 5,044,000 tons, for anthracite, and 4.10, based on 184 fatalities and 44,914,000 tons, for both bituminous and anthracite combined. Compared with February, 1930, the fatality rate for March of the present year was higher for the industry as a whole and for bituminous mines, while a slight decrease is shown in the rate for anthracite mines.

Reports for the first three months of 1930 showed that accidents at coal mines caused the loss of 552 lives, which by a strange coincidence was the exact number of fatalities which occurred in the coal mines during the same period of 1929. The production of coal thus far in 1930 is 142,852,000 tons, showing a death rate of 3.86; that for the period January to March, 1929, was 158,961,000 tons, with a fatality rate of 3.47. Thus it will be seen that the accident record for the first three months of 1930 is not as good as that for the corresponding period last year. Separated into bituminous and anthracite groups, the rates for the three-month period of 1930 were 3.46 and 6.71, respectively, while those for the same period of 1929 were 3.12 and 6.04, respectively.

Three major disasters—that is, disasters in which five or more lives were lost—occurred in the month of March, 1930. These were all explosions; one at Lynn, Utah, on March 8, caused the death of 5 men; one at Arnettsville, W. Va., on March 26, caused the loss of 12 lives, and one at Kettle Island, Ky., on March 30, resulted in 16 fatalities. In March a year ago one major disaster at Parnassus, Pa., took a toll of 46 lives. Six major disasters have occurred thus far in 1930, with a resulting loss of 71 lives, as compared with two similar disasters in the same period of 1929, with 60 deaths. Based exclusively on these major disasters, the fatality rates per million tons of coal produced were 0.497 for 1930 and 0.377 for 1929.

A comparison of the accident record for the first three months of 1930 with that for the same months of 1929 shows a reduction in the fatality rates for haulage and explosives, while an increase is noted for falls of roof and coal, gas or dust explosions, and electricity. The comparative rates are as follows:

Cause	1929	Jan.-March, 1929	Jan.-March, 1930
All causes	3.581	3.473	3.864
Falls of roof and coal	1.934	1.749	1.974
Haulage	.675	.686	.602
Gas or dust explosions:			
Local explosions	.082	.101	.168
Major explosions	.238	.371	.476
Explosives	.145	.157	.154
Electricity	.133	.069	.140
Miscellaneous	.374	.340	.350

Kettle Island Blast Caused By Open Light

An open light carried by an employee coming in contact with a body of gas is given by John F. Daniel, Chief of the Kentucky Department of Mines, as the cause of the explosion in the Kettle Island (Ky.) mine of the Pioneer Coal Co., March 29, which caused the death of sixteen men. The flaming gas in turn ignited coal dust thrown up in the air by the concussion accompanying the gas explosion. Effects of the dust explosion were felt over various rooms and entries, all the workmen in the mine being suffocated in its wake.

Mr. Daniel further stated that if the mine had been rock-dusted, with the rock dust properly applied, the explosion would have been quickly stopped with the loss of only one life instead of sixteen.

Coal Mine Fatalities During March, 1930, by Causes and States

(Compiled by Bureau of Mines and published by *Coal Age*)

State	Underground												Shaft					Surface							Total by States	
	Falls of roof (coal, rock, etc.)	Falls of face or pillar coal	Mine cars and locomotives	Explosions of gas or coal dust	Explosives	Suffocation from mine gases	Electricity	Animals	Mining Machines	Mine fires (burned, suffocated, etc.)	Other causes	Total	Falling down shafts or slopes	Objects falling down shafts or slopes	Cage, skip or bucket	Other causes	Total	Mine cars and mine locomotives	Electricity	Machinery	Boiler explosions or bursting steam pipes	Railway cars and locomotives	Other causes	Total	1930	1929
Alabama	4						2					6													6	5
Alaska																									0	0
Arkansas																									0	1
Colorado	1	1	1									3										1	1	2	5	6
Illinois	6		2	3							1	12													12	4
Indiana	1											1													1	3
Iowa	2											2													2	3
Kansas																									0	1
Kentucky	7		3	16			1					27													27	10
Maryland											1	1													1	0
Michigan																									0	0
Missouri																									0	0
Montana																									0	0
New Mexico			1									1													1	1
North Dakota					1							1													1	0
Ohio	4		3							2		9													9	6
Oklahoma																									0	0
Pennsylvania (bituminous)	7	2	3							1		13			1		1	2		1				3	17	74
South Dakota																									0	0
Tennessee	2											2													2	2
Texas																									0	0
Utah	2			5								7													7	0
Virginia	3		1		1							5													5	4
Washington								1				1													1	2
West Virginia	12	5	13	12			1					43													43	31
Wyoming																									0	1
Total (bituminous)	51	8	27	36	2		4	1		3	2	134			1		1	2		1		1	1	5	140	154
Pennsylvania (anthracite)	16		3	2	4	2					2	29													29	30
Total, March, 1930	67	8	30	38	6	2	4	1		3	4	163			1		1	2		1		1	1	5	169	
Total, March, 1929	78	13	25	48	3	1	1		2		4	175	2		1	1	4		1	1		1	2	5		184